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FLOATING DERRICKS OF NEW YORK HARBOR.

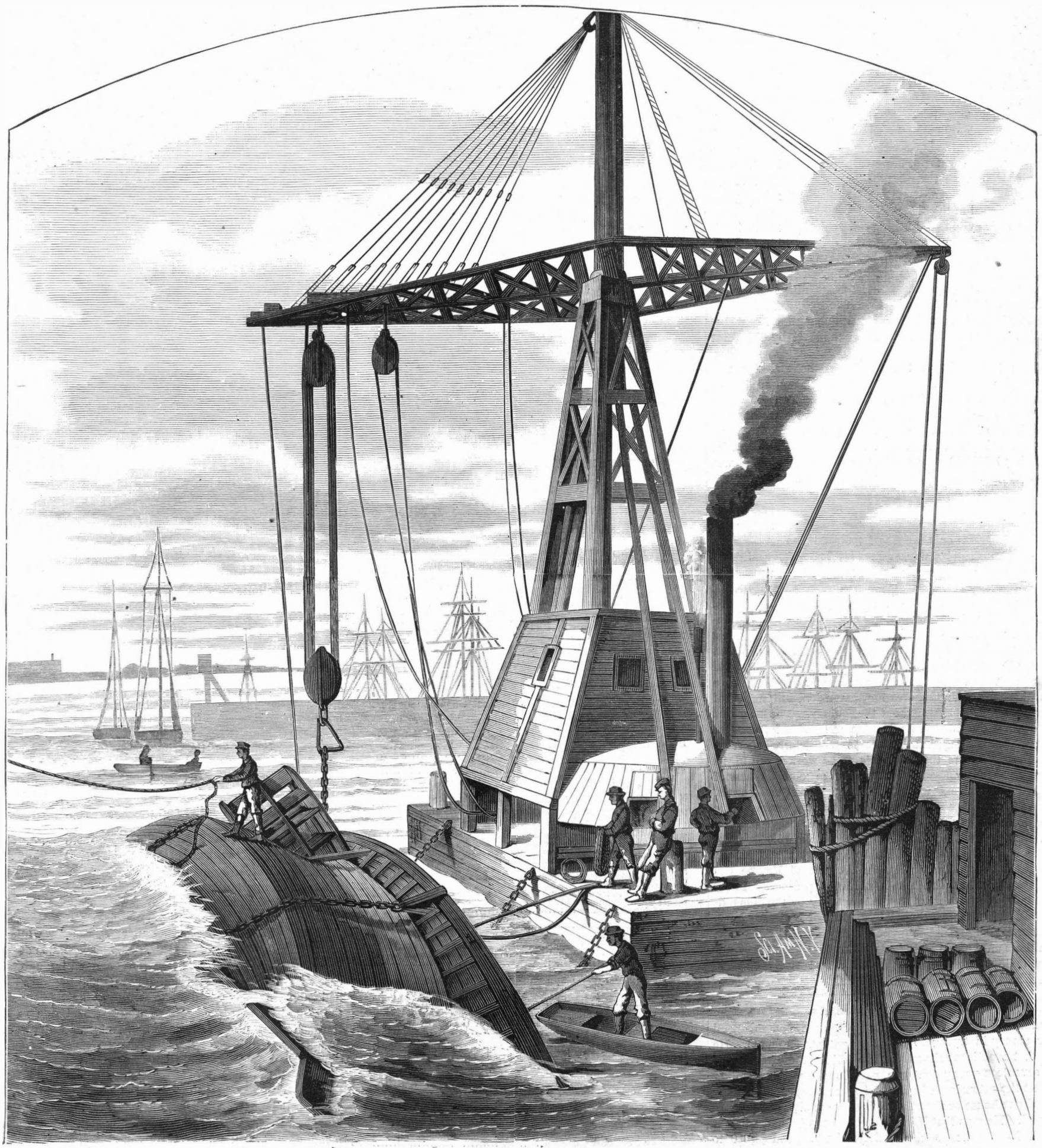
There is no harbor in the world so crowded with shipping of all kinds, propelled in so many different directions, and under so many trying conditions of time and tide, as the harbor of New York; and it is not strange that occasionally a vessel should meet the fate of the Oliphant. It is simply wonderful that accidents are so exceedingly rare, when, in spite of wind and tide, huge ferryboats are constantly crossing the paths of river, Sound, and ocean steamers and sailing craft of all kinds.

The steamboat Oliphant, better known as the Wall street annex boat of the Long Island Railroad, while on her way from the pier at Pine street, to connect with a train at Hunter's Point, was run into by the ferryboat Warren, plying between Grand street, Brooklyn, E. D., and Grand street, New York. The passengers and crew escaped from the Oliphant to the Warren, the latter being only slightly injured. An effort was made to tow the Oliphant to a pier to make her fast, but she capsized before this could be accomplished. The Oliphant was 146 feet long, 146½ tonnage, and was licensed to carry 400 passengers. She was a short time since furnished with new engines and boilers.

Our engraving represents the floating steam derrick E. K. Collins, of the Morgan Iron Works, having its tackle attached to the Oliphant preparatory to righting and raising her. These huge derricks are capable of raising bodily boats of ordinary sizes. Captain McDonald, of this derrick, says he has raised sixty-five sunken vessels with it. Not long since one of the Harlem steamers was sunk on Saturday, was raised on Sunday, and was running again on Monday.

There are in this harbor four floating derricks, ranging in lifting and carrying power from 65 to 100 tons. Two of them are owned by private individuals, one belongs to the Department of Docks, and another to the Brooklyn Navy Yard.

The raising of vessels is but a small part of the work per-



FLOATING DERRICK—RAISING THE WRECK OF THE OLIPHANT, EAST RIVER, NEW YORK.

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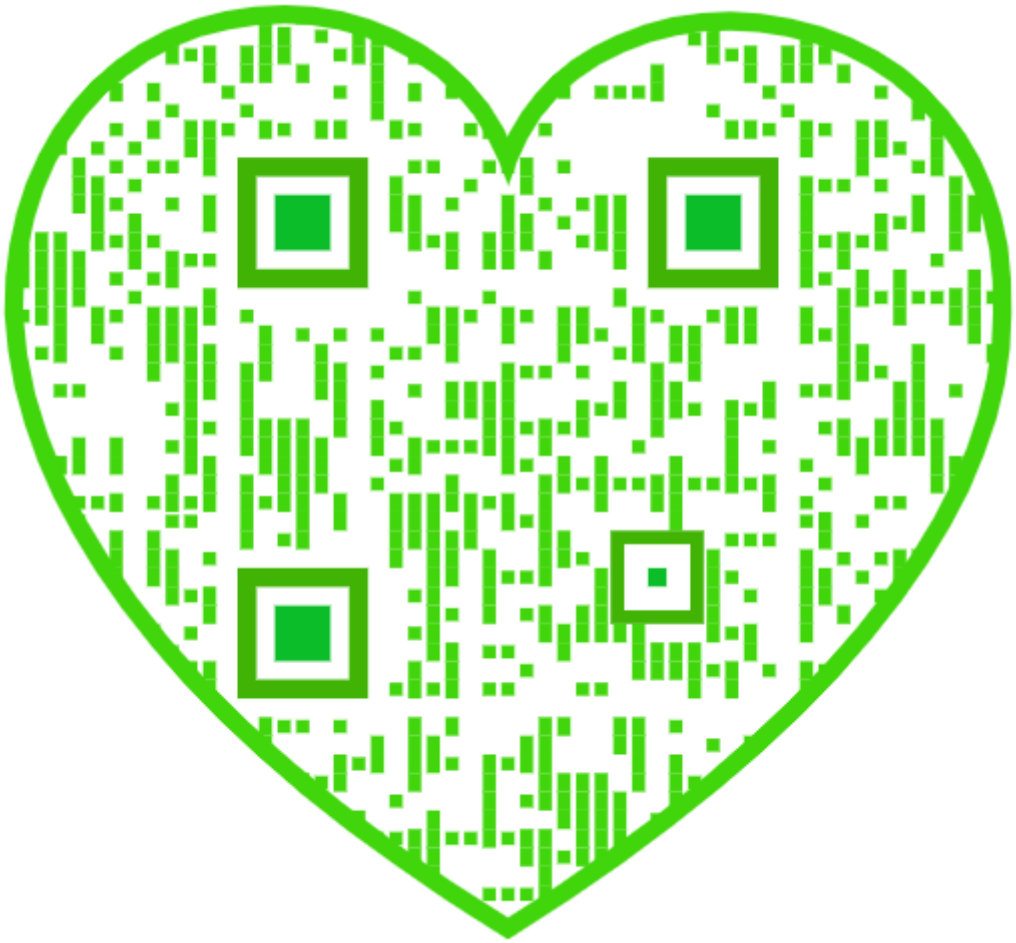

formed by these huge machines. They are used for transferring heavy freight from vessels to the docks and from the docks to vessels, for placing boilers and machinery in steamers, for lifting and carrying blocks of granite and artificial stone for engineering works, and for handling other bodies too heavy and too bulky to be handled by other means.

The derrick is carried by a large rectangular float well braced and stiffened by trusses. The tower which supports the king post and booms is about sixty feet high, and is built of large timbers well framed and bolted together. The boom is supported by a number of diagonal rods which converge near the top of the king post and are secured to it by heavy forgings which straddle the iron cap at the top of the post. All of the hoisting machinery is placed on the float under the tower and controlled by the engineer.

IRON LIGHTHOUSE FOR MEXICO.

The Keystone Bridge Company, of Pittsburg, are putting the finishing touches to an iron lighthouse ordered for the Mexican Government by Don Vincente Riva Palacia, late Minister of Public Works of the Mexican Government. The work was carried on under the Supervision of Don J. Ramon de Ibarrota, Engineer to the same government. The structure presents an unfamiliar sight to the inhabitants of the smoky city, rearing its graceful proportions high into the air near the banks of the Allegheny River. When completed the lighthouse will be taken apart, shipped by rail to New York, and thence by sea to the mouth of the Tampico River, where the structure is to be put up.

This house is a skeleton structure, made up of seven series or stories of cast iron columns, braced and tied by struts and tie rods, the whole arranged about a central stair cylinder of cast iron, so as to form a hexagonal tower, 146 feet 7 inches high from weathercock to base. The latter is 46 feet in diameter, tapering to 18 feet 10 inches at the lantern room. The lantern and revolving apparatus are awaiting the lighthouse at Tampico, having been made for this structure at Birmingham, England. Just below the lantern is the "service room," for the use of those in charge of the light. This space is roofed with the castings forming the floor of the lantern room, and a neat railing surrounds the hexagonal space embraced in this floor.

The "stair cylinder" forming the central portion of this lighthouse is of cast iron, 7 feet diameter and ½ inch thick, and composed of 14 sections, bolted at the joints through flanges. The spiral stairway inside the cylinder comprises 173 cast iron steps, spaced by six landings, at each of which a window is let into the cylinder. The weight of this whole structure is 150 tons, and its cost at Pittsburg about $15,000. Another will be built for the Mexican coast by the same firm.

Before taking down the lighthouse its stability was thoroughly tested. A pressure was brought to bear against one side equal to a wind strain of 40 pounds per square foot. The area so subjected being 360 square feet, the test was equivalent to 1,800,000 pounds wind strain needing to upset the structure. The momentum of the lighthouse to resist this being 1,840,000, the surplus in favor of stability was still 40,000, and this without any anchorage whatever.

Prosperous France.

France is affording fresh proof that she is one of the most wonderful nations on the face of the earth. The disasters of the Franco-Prussian war, and the payment of five milliards of francs as the further penalty for entering upon that war, would have crippled an ordinary nation. But France is not an ordinary one, and the result is that she has not only cast off her burden, but contemplates an outlay in internal improvements such as the most prosperous country could alone entertain. It will be remembered that M. de Freycinet, the new Prime Minister of France, before leaving his old department, drew up an elaborate report embodying a gigantic scheme for the creation, extension, and union of railways and canals throughout the country. The estimated cost of these improvements is nine milliards of francs, or £360,000,000 sterling; but France is not deterred thereby, and in twelve years the scheme is to be worked out in its entirety. Already France is noted for the completeness of her railway system, which, with her rivers and canals, afford a means of communication a pparently leaving little to be desired; but she is impressed with the belief that improvement is possible, and she is going to add 16,000 miles to her railways, and 900 miles to her rivers and canals. This fresh burst of enterprise on the part of France can have but one effect, and that is increased prosperity in the great industries already stirred into activity by the demands of India, America, and the colonies. Rumor is already busy, says our excellent English contemporary *Capital and Labor*, with the names of English firms about to contract with the French Government, while the iron and steel trades in America and Belgium must also benefit.

Interesting to Patentees.

Senator Hoar strongly advises patentees not to spend their money in trying to get their patents extended. He says that experience shows that no bill for the extension of any seventeen year patent can pass Congress. The feeling against the extension of patents is very strong. Bills have passed one house or the other, but they are always beaten in the end. He says that if he had a brother who had a patent worth $50,000, he would not advise him to spend $1,000 to get it extended.

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WORK AND WAGES.

We have been surprised that the volume published a few months since by the National Government on the "State of Labor in Europe," has not received more general attention than it seems to have attracted. The statistics, as furnished by the various United States consuls, purport to cover the rates paid for labor in all the leading industries, together with the cost of living in Great Britain and in nearly every country on the continent of Europe. Elaborate tables are also given comparing the averages thus obtained with the rates of wages paid and the cost of living in this country. In addition to the above, our accomplished Secretary of State, who himself obtained the home statistics relative to labor and the cost of living, carefully edited the volume, and, in an extended introduction, gives us a synoptical résumé of its contents, together with some general conclusions of his own.

Now every one will concede that Mr. Evarts, with his wide and varied culture, is a close reasoner, and there is hardly a subject of general interest on which he cannot write or speak so as to command the attention of all thinking men. In treating of this subject, however, it may well be doubted whether he does not carry his generalizations much too far; for, certainly, the tenor of his whole discourse is to point out that our workingmen must accept lower wages in future. The mechanics and artisans in the housebuilding trades, and in every local as well as general occupation, must, according to his argument, in the near future be content to accept for their remuneration wages more nearly approximating to those obtained by European workingmen. The principal ground on which this reasoning is predicated lies in the much higher rates per day now paid to American workingmen, which, the Secretary argues, cannot be permanently maintained when we are exporting largely of domestic manufactures, in competition with the products of the cheap labor of Europe; yet, in another place, he says: "The average American workman performs from one and a half to twice as much work, in a given time, as the average European workman." It is quite a different thing, as every employer knows, to compare the wages per day or hour of different sets of work men, from what it is to estimate the cost of labor under differing circumstances, as shown in the completed work. The former method is the one generally adopted by those who talk or write on the subject; the latter must control the operations of all who succeed in every line of business. The English workman who receives the highest average wages in Europe comes nearest to doing as much as the American workman, but on the Continent, where wages are lowest, so also is the quantity and quality of the work. The consul at Leipsic writes that "an active American workman will do as much work in a given time, at any employment, as two or three German workmen," and the volume abounds with such remarks, which do not put the case a whit more forcibly than we have often heard it stated by American manufacturers who have investigated the matter in personal visits to foreign workshops. The fact is, in making comparisons of this kind, so many things have to be taken into consideration to make the conditions equal, that they seldom give one more than an approximate idea of the situation.

But if it is inevitable that we are to have a sort of leveling process in the rates of wages in "the world of educated and progressive labor," why is there not good reason to suppose there will be some "leveling up"? The average rates of labor throughout Europe have advanced from 25 to 30 per cent since 1850. The upward movement was checked when the speculative era following the Franco-German war reached its climax, and since then, contemporary with the extreme depression which was felt here from 1873 to the commencement of 1879, all branches of productive industry have been undergoing a severe strain. This, however, has not caused any very material reduction in the rates paid for labor, and with the first indications of returning prosperity it is probable that wages will at once be advanced in proportion there, as they already have been in many kinds of business here. A great improvement in trade and manufactures has already been experienced in England, notwithstanding the general failure of the crops there the past year, and, although Mr Evarts' conclusions were formed eight months ago, we have yet to see the evidence that any considerable number of English workingmen are "sorrowfully standing between their idle factories and the emigrant ships."

COTTON SIZE AND COTTON SIZING.

Not long since we had occasion to notice a legal trial in England in which the work of the professional cotton sizer played an important part. From the evidence which the judge required to be given in open court, it appeared that it was a common thing for English cotton goods to be loaded with size, so as to double their natural weight, while in some cases the fiber carried two and a third pounds of size for every pound of pure cotton. In commenting upon the case the judge said that the manufacturer and the warp sizer had entered into a conspiracy to defraud the public; and to the American mind that seemed a fair description of the transaction. English manufacturers and traders, however, do not so regard it.

We have before us a large and well made octavo volume of some three hundred pages ("Sizing and Mildew in Cotton Goods." Manchester: Palmer & Howe), about half of which is devoted to the art of sizing. Its authors are three Manchester chemists of good repute; and in a letter commending the work to our favorable notice, the publishers assure us that this is the first time the subject has been

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treated in such an exhaustive manner. That portion of the work devoted to mildew is certainly valuable. The first part is—well, instructive, to say the least, though we sincerely trust that the art, as practiced in England, will not find favor in the eyes of American manufacturers.

Touching the practice of heavy sizing, the authors say in their preface that it does not concern them immediately; still, if there be a demand for weighted cottons, and they are properly described, they see no reason why the demand should not be met. The practice of regarding heavy sizing as an adulteration, they say substantially, in another place, they do not consider at all logical; as they 'fail to grasp a parallel that a man commits a fraudulent act who coats a white metal tea service with silver, or plates a set of harness with nickel." They argue that as the manufacturer does not sell direct to the consumer, but to the trader, and simply makes such a line of goods as the trader calls for, therefore the practice of making three pounds of shirting out of one pound of cotton and two pounds of clay and other materials, is perfectly legitimate, or as much so as plating white ware with silver.

The argument would be more convincing and the parallel juster if it were assumable that the makers of plated articles were in all cases well aware that their goods were to be imposed upon unintelligent buyers as pure silver, and took pains to abet the frauds by marking their wares accordingly. The fact that for a time such dishonest products have been disposed of in enormous quantities, as our authors frankly assert, is no proof that there is a real demand for them from consumers; and the loss of favor which English cottons have experienced in China and elsewhere, rather goes to show that many buyers of such goods have been swindled, and that in the long run the practice of overloading cottons will be found the reverse of profitable. But we did not set out to discuss the morality of heavy sizing, or the policy of it, but rather to describe the materials used and the way they are applied.

To a limited extent sizing is a process not only legitimate but really necessary in cotton weaving with single yarn. Its object is to bind the fibers together to strengthen the warp to enable it to withstand the strain of the loom, and to diminish the fraying action of the reed by giving the thread a smooth and even surface. This is especially necessary when the staple of the cotton is short and the fibers but loosely bound together in the spinning of the yarn. For this legitimate purpose starch paste is quite sufficient. With pure starch size it is easy to add 20 per cent to the normal weight of the cotton. By adding other ingredients the loading can be and is increased tenfold or more. To describe the elaborate machinery used in sizing would carry this article beyond the space allowable, besides diverting it from its intended purpose.

The various systems of sizing are classed as follows: 1. Sizing the yarn when on the loom. 2. Sizing in the hank. 3. Sizing the yarn in the warp or chain. 4. Sizing the yarn when spread out so as to represent a sheet, each thread being as nearly as possible at an equal distance from its neighbor. The first method is exclusively practiced by the hand loom weaver, and is of slight importance, very little weaving of that sort being done now except in China and India. For power loom weaving sizing in the hank is exclusively confined to colored goods. This method, like the former, is falling into disuse. The sizing of ball warps and chains is more largely practiced, and consists of two operations, the sizing and the drying. In the first the yarn is run between squeezing rollers to exclude the air, then through a box (sow-box) filled with size, then between another pair of rollers to squeeze out the excess of size. The drying is done over steam heated cylinders. The fourth and most important method of sizing is chiefly practiced on the Slasher sizing machine, which sizes and dries the yarn, and otherwise prepares it for the loom by one continuous though complex process.

The authors give an analysis of a sample of heavily sized warp, as follows:

Cotton fiber.	Pure cotton	33·18	
	Natural moisture	2·65	35·88
Size.	Starchy matters	16·16	
	Moisture with size	7·81	
	Fats	3 04	27·01
Mineral.	Natural ash	1·00	
	China clay	32·07	
	Chloride of magnesium	3·25	
	Chloride of zinc	0·84	37·16
			100·00

Thus it appears that in every hundred pounds of such warp there are about 36 pounds of cotton fiber, 27 pounds of size, and 37 pounds of mineral "loading." In other words, for every pound of pure cotton there is a pound and seven-ninths of foreign matter. A little further on the authors say that "common eight and a quarter pound shirtings are usually very heavily sized," and give analyses of two samples, one showing 3 pounds 6 ounces of size to 4 pounds 13 ounces of cotton, the other giving 3 ounces more of size and so much less of cotton.

The authors are careful to say that sizing and weighting should be considered as two distinct processes. "The former is a necessity, the latter not necessarily so." There is still another loading operation carried on by people called "stiffeners," who take the cloth, after it has been sold by the manufacturers and give it an additional load of clay, gypsum, heavy spar, Epsom and Glauber's salts, starch, tallow, and so on. The authors considerately remark that this practice "cannot, of course, be defended upon any ground save that of cheapening the fabric. Some merchants, however, find this to be necessary;" though it is not easy to see how a finished fabric can be made cheaper even by adding to it so cheap a substance as clay—unless a portion of the clay can be palmed off upon the consumer as cotton. It was shown in the somewhat famous Manchester goods case, a year ago, that the cost of the sizing compound was just 3 farthings a pound, or about one-tenth the cost of cotton. In the case in question the cotton in dispute had 4 pounds of size to 4 pounds 3 ounces of fiber

The various materials used in sizing are of four classes. (1) Starchy matters used to strengthen the yarn and facilitate the weaving; (2) fatty substances used to soften, that is, to allay the harsh and dusty feel of dry starch; (3) other organic substances; and (4) mineral matter used to increase the weight of the goods. To prevent mildew a large number of antiseptic substances are also employed. All these articles are described at great length, with their special properties and the manner of preparing and using them. For pure sizing the starches most generally used are those of the potato, sago, and wheat. Farina gives a harsher feel than sago, making a more liberal use of fatty matter necessary. Deliquescents are also required, especially when clay has been used, to keep the clothes from becoming dusty. Tapioca, corn starch, rice flour, arrow root, and other starches are often used. In the second class fall tallow, cocoanut oil, palm oil, castor oil, olive oil, animal and vegetable waxes, paraffine, etc. In the third class are glucose, glycerine (which gives a nice soft feel to the cloth, especially in conjunction with much china clay, and which with dextrin and alum makes the dressing for fine muslin yarn), dulcine (a mixture of glycerine, gum, and Chinese wax, introduced into Manchester by two of our authors), Irish moss, glue, old lant, or urine, and various soaps.

In the class of mineral substances we find china clay (disintegrated feldspar), steatite (soapstone or silicate of magnesia), sulphate of lime (plaster of Paris, gypsum, terra alba, etc.), sulphate of magnesia (Epsom salts), sulphate of baryta, or heavy spar, sulphate of soda, or Glauber's salts, silicate of soda, or water glass, and ultramarine blue. All these serve to increase the weight of the fabric. To them are added chloride of calcium mixed with the chlorides of magnesia and zinc for purposes of adulteration.

Chloride of calcium is a deliquescent pure and simple, and serves the purpose of keeping the china clay moist during the weaving process. The authors say that it should never be used for weighting purposes. "Weight can be much more easily and safely introduced by means of china clay than by deliquescent substances." Chloride of magnesium is often used as an antiseptic, but the authors are confident that without an admixture of chloride of zinc it will not prevent mildew.

These various materials variously mixed are applied by the makers of cotton goods to the warp only. The weft is not sized for the weaving process. But this leaves too much unloaded fiber to suit the English merchant. Accordingly, as the authors remark, "it is an established custom to stiffen already heavily sized goods after they have left the manufacturers' hands. Ordinary 7 pound gray shirtings are filled with size, Epsom salts, Glauber's salts, or mixtures of these, so as to make them weigh and resemble, as far as possible, 8¼ pound shirtings." This adulteration is easily seen, since both the warp and the weft threads, and also the interstices, contain foreign matter, "exactly as bleached and filled goods do."

MAKING KNIT COTTON GOODS TO IMITATE WOOL.

When knit shirts and drawers were first introduced, a large proportion of the substance of the goods was wool. The great extent to which cotton is now used in the manufacture of knit undergarments makes it almost ridiculous to speak of these articles of apparel as "flannels." It is now nearly fifty years since the first successful power knitting machine was made. And here, by the way, it may be interesting to remark that, although a hand machine had been in use in England for nearly two centuries, and numerous efforts had been put forth to adapt it to run by power, it was reserved to an American to succeed in this direction. An enterprising storekeeper in Albany, N. Y., saw the need of such an invention, and hired a young man then working in a cabinet shop there to make the attempt. The latter purchased on old hand frame for $55, in April, 1831, on which he commenced his experiments, and in six days had so arranged the apparatus that it would knit by turning a crank at the side.* In the fall of 1832, the invention had become so far a practical success that a small factory was then started to make knit goods with it in Cohoes, N. Y., and the old "reciprocating frame," then first put into use, not only made the fortunes of the storekeeper and the inventor, who set out in so business-like a way to accomplish their object, but started an industry which has since become of vast magnitude.

At first, as we have said, the material used consisted largely of wool. It was not until after several years that it was found that one half cotton would make a good serviceable article, but then and ever since it has been customary to sell these knit undergarments, wherever possible, as woolen fabrics. The experienced housekeeper, or ladies who purchase their own dress materials sufficiently to become somewhat acquainted with the difference between cottons and woolens, probably know better, but the great majority of customers for the goods do not. There are few people, however, we venture to say, who suppose that, in purchasing these goods, they are buying fabrics with absolutely *no* wool in them. Yet such is really the case in a large proportion of the goods made. It is probable that fully one half of all the knit shirts and drawers made in this country are manufactured from cotton exclusively, and, where any wool is used, it forms a very small proportion of the total weight of the fabric. We know of one manufacturer who, two years ago, made up a lot of goods in which he put twenty per cent wool; but he found it difficult to get more for them than others obtained for an all-cotton article; his conclusion was that fabrics containing so much wool were "too good" for the general market, and he has since used cotton only.

But, with the substitution of cotton for wool, the manufacturers have constantly been making strenuous efforts to produce goods which would look as though they were made of wool. Great attention has been paid to the bleaching and dyeing, and, in making white goods, two or three particular shades of white are given to the fabrics, according as it is desired to represent Texas, Ohio, or California wools, etc. In the dyeing of colored goods, the dyes used are especially intended to give effects which might lead a customer to suppose the goods were made of wool, and colors which will not take well on cotton are avoided. Of course, it is not to be supposed that those who buy and sell the goods are deceived, unless it may be among the small dealers; among those who wear the goods, however, we doubt whether one in fifty would acknowledge wearing undergarments made of cotton alone, and most of them would be extremely indignant at having this fact brought home to them, although every manufacturer knows that hardly one in fifty of those who wear these goods have garments with any appreciable proportion of wool in them.

* Marten's "History of Cohoes."

COMPRESSED AIR IN COAL MINING.

The only mechanical coal digger that ever obtained a foothold in the great Pittsburg coal fields is that now at work in the mines of Henry B. Hays & Bro., near the city named. Its use is regarded with such disfavor by the miners as to warrant the supposition that as a digger it is a practical success. This machine is driven by compressed air, and is a recent invention of Mr. M. H. Lechman, of Columbus, Ohio. In appearance it resembles a Woodworth planer placed low upon the ground and borne upon small wheels running on rails. The mission of the Lechman machine is not, strictly speaking, to mine coal, but to "bear in." This operation by the ordinary method requires the miner to assume a most trying position in order to properly undermine the overhanging mass of coal, which is afterwards dislodged by wedges. Two and a half feet is the extreme "bearing in" distance by hand, and to accomplish this reduces a large amount of coal to an unmarketable state.

The construction of the machine in question is peculiar. The oblong steel frame is double, and capable of elongation, like the joints of a telescope. The forward end of the sliding portion bears a cutter shaft similar to that of a planer. This shaft is armed with serrated cutters resembling in action and form the cutting arrangement of a moulding machine. The shaft bearing these cutters is revolved by means of an endless chain taking power from the driving shaft located across that end of the machine furthest from the cutters. The shaft is driven at 700 to 1,000 revolutions per minute by a pair of upright cylinders located one on each side of the machine. These are 5 inches in diameter and 6 inch stroke, taking air at 60 pounds. Being brought with its forward end against the face of the coal, and 1 foot from the bottom–to clear the stratum of "ground coal"–the machine is ready for action. Air being turned on the cutter bar soon dives out of side as the sliding portions of the digger are moved forward by a suitable screw feed. The cut made is 4 inches deep—perpendicularly—3 feet wide, and extends into the coal seam 5 feet. This cut has been made in four minutes, but usually occupies ten minutes.

Suitable scrapers attached to the endless chains clear away the coal dust produced. When it is considered that a day's work for two able-bodied miners is the "bearing in" 2½ feet across 15 feet of coal, the relative speed of the machine undermining to twice the depth of the miner's pick will be noted. As an offset to this is placed the weight, first cost, and subsequent repairs involved by machine labor. The Lechman machine weighs nearly a ton, costs $500, and needs frequent repairing. The Pittsburg coal seam is a trying test, however, inasmuch as the 4 inches taken out by the cutters includes a double strata of extremely hard slate overlying the bottom or ground coal. As compared to the pick the action of this machine is as the saw to the ax in the felling of a tree or the cutting of a log. There would seem to be a wide field for inventive genius in the matter of a mechanical device that would be free from the objections noted above, and that would not require the conveyance of power from a distance to the cutting device.

EMAIL INK.—The drug house of Louis Muller, in Leipsic, has put on the market colored inks which may be used for writing labels on glass, porcelain, ivory, marble, mother-of-pearl, and metal. The writing is done with a goose-quill, and, when dry, adheres so firmly that it cannot be removed by any liquid. Four different colors are made—black, white, red, and blue.—*Drog. Zeit.*

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IMPROVED PORTABLE ENGINES.

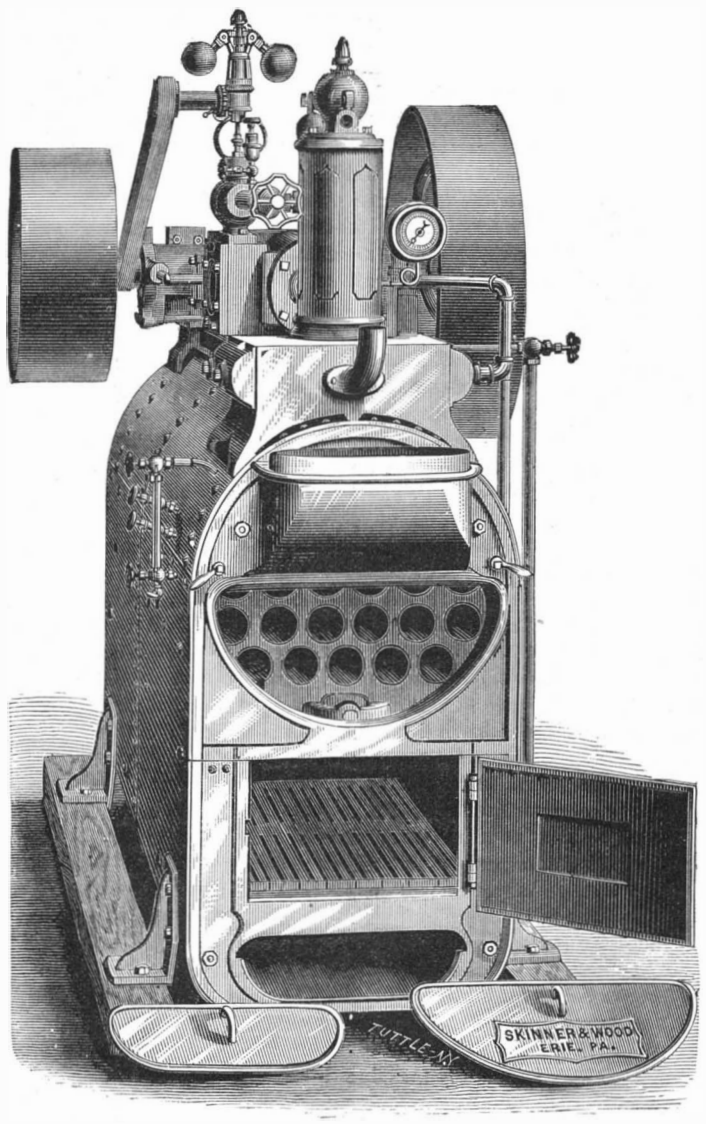
We give on this page two views of a compact and simple portable engine manufactured by Messrs. Skinner & Wood, of Erie, Pa. They are made in various sizes, from 2½ to 15 horse power inclusive, and special pains have been taken to adapt them to the smaller industries, also to domestic and agricultural purposes. The manufacturers inform us that they have hundreds of them doing work in printing offices, shops of all kinds, cheese factories, and dairies, in elevators and mines, and on the farm and plantation. These engines in more than ten years of use have earned a reputation for durability and economy, and they are very well and favorably known in many places outside of the United States. The salient features of this engine are its boiler and accessories, its stop-motion governor, its self-oiling connecting rod, and the drip catching devices.

The boiler, which is horizontal, is made of the best CH No. 1 iron in cylindrical form, and provided with return flues of the best lap welded iron, and is well arranged for economy and safety. The fire box has a movable bridge wall to adapt it to different kinds of fuel. The grate surface is ample for coal, wood, or shavings, and admits of the use of fuel which could not be used in most small engines in market. The bridge wall is made hollow to admit air to the gas and flame which pass over it, and thus complete the combustion of the fuel, avoiding smoke and the loss of heat generating material.

The stop motion governor, which is fitted to all of these engines, was suggested by the danger and annoyance which follows the breaking or running off of the governor belt. This, we believe, is the first instance of the application of a governor of this kind to portable engines. In case of the breakage of the governor belt, the weighted lever attached to the governor immediately drops and stops the engine. This lever may be adjusted by moving its weight, so as to change the running speed of the engine. The governor needs no readjustment when stopping or starting the engine. It is only in case of the breakage of the governor belt that it requires attention, and then the readjustment is accomplished in a moment.

The connecting rod used with this engine is of steel and of new and peculiar construction. It is provided with bronze boxes of the best quality, which are made hollow in part to receive oil. This forms a very efficient oiler, which does not require filling oftener than once in two or three days. The device for taking up the wear of the connecting rod is both novel and effective.

All of the parts of these engines are made to steel gauges, and may be easily replaced if broken or injured. The makers have studied to give these engines the good qualities of the larger engines, and at the same time to keep the prices within the reach of those requiring a small, convenient, and safe power.



PORTABLE ENGINE.—SIDE VIEW.

AGRICULTURAL INVENTIONS.

Mr. James H. Tanner, of Waco, Texas, has patented a combined planter and cultivator which is so constructed that the seed dropping appliances can be readily detached and the machine adjusted for use as a cultivator.

An improved fertilizer distributer, patented by Mr. Samuel H. Everett, of Macedon, N. Y., consists of a box in which a spoked wheel is revolved horizontally, by suitable mechanism, under a hinged adjustable shelf or cut-off and over a diagonally arranged opening in the bottom of the box, so that the delivery of the phosphates is made continuous and uniform by the passage of the spokes of the wheel over the diagonal opening.

Mr. Daniel Unthank, of Spiceland, Ind., has invented an improved two-horse cultivator, which is so constructed that the plows may be moved laterally and vertically without changing their pitch. It may be adjusted to give the plows any desired pitch to cause them to work deeper or shallower in the ground and to work closer or farther from the rows of plants.

Mr. Richerson W. Spencer, of New Lexington P. O., Ala., has patented an improvement in that class of cultivators by which both sides of a row can be cultivated at the same time; and it consists of certain novel features which cannot be described without drawings.

Mr. Edward N. Griffith, of Irvington, N. J., has patented a spading fork adapted for use in any soil. It consists in a spading fork having tines as usual, and formed between the tines at the head with knife edges, whereby the fork may be used to cut grass, sod, or roots, or to take the place of a spade in addition to its ordinary use as fork.

American Innovations.

The use of folding beds and cribs is becoming very fashionable in the United States. It is a question whether such beds would "take" in England, where the preference is given over wooden bedsteads to those of iron and brass. but in many other countries where it is customary to use the sleeping room as a day or living room, the folding bed, if known, would be a boon. Those known as the "Champion" automatic folding beds and cribs are really handsome articles of furniture, are easily manipulated, and of most simple construction. When open and ready for use they are most like an ordinary bed, and when closed or not in use they exhibit all the ornamentation and finish of a superior cabinet. Economy of space and appearance are not their only merits, for besides these advantages they are moderate in price. Another piece of furniture manufactured by the patentees of the "Champion" folding bed is a reservoir washstand in the form of a writing desk. When not in use this washstand has every appearance of a well finished and handsome desk, and is useful for that purpose. The washstand is a fit adjunct to the folding bed. The same company have some other novel and useful articles of house furniture which we may notice at another time.

Another description of folding beds, known as the "Burr," is designed to be serviceable for other than sleeping purposes. For instance, besides the ordinary cabinet bed, the "Burr" Company make the wardrobe bed, with a mirror 20 inches by 52 inches; the bookcase bed, with three drawers, three mirrors, and bookcase top; the buffet bed, with a sideboard top and shelves; and the desk bed, all of which are extremely elegant.

In designs for refrigerators American makes are fast leaving the beaten track. In all hot countries it has become a necessity to plan means for keeping articles of food in a fresh and cool state, and being themselves the inhabitants of a portion of the globe which is pretty hot in summer, the Americans have been compelled to combine experience with invention in this branch. Refrigerators are now in common household use in America, and they are not unknown on the railways, in the shape of specially constructed cars for the transport of produce, dead meat, fruit, etc. But we have to do at the present with small refrigerators for domestic use. These are the common chest refrigerators of the "Excelsior" pattern, suitable for the uses of a small household; the "Excelsior" and "Diamond" upright refrigerators with three or four shelves, the "Excelsior" double upright refrigerators of larger dimensions; beer refrigerators, and others too numerous to mention. With improved ice chambers, channels for the free current of air, etc., these refrigerators are now about as perfect as could be conceived. In South America, Australia, the Cape, and India, there ought to be an immense market for these goods.

The old fashioned three wheeled perambulator, which yielded *Punch* a rich harvest of jokes and cartoons, is not known in America; but, instead, the nursemaids and young mothers have the delight of driving out their charges in carriages of the most beautiful shape and finish. These baby carriages, the manufacture of which has become quite an industry in the States, are modeled upon the lines of the most exquisite Victorias or the neatest of broughams and phaetons. They are got up in the best possible manner, C and elliptic springs, electro-plated mountings, and the finest upholstery. All have four wheels, some with carriage tops, and others with adjustable sun shades. It is a pleasure to wheel these carriages, they are so light and handy, they satisfy the eye, and they give the young occupant ease and comfort. The baby carriage has been so largely adopted in the States that one seldom sees a child in arms now. Undoubtedly the very elegance and the comparative cheapness of these carriages will command a large demand for them out of the United States.

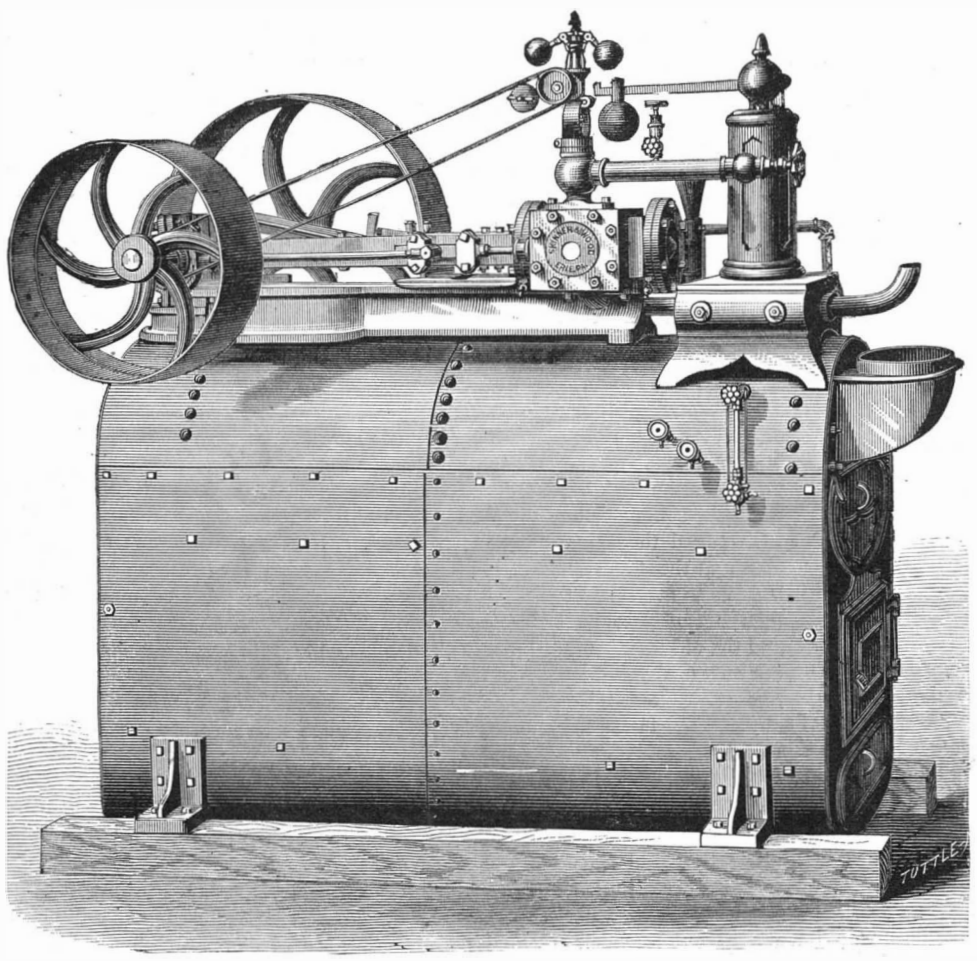
To write anything particularly new about the manufacture of boots and shoes by machinery would be difficult, because it must be pretty widely known that this trade has assumed enormous proportions in the Northeastern States.

So large has this industry become, it would not surprise many to learn that the home demand is too small for the production, and that the overplus must therefore find a market for itself in countries outside of North America.

These remarks, however, are beside our present intention; what we desire more especially to point out is the immense demand for steel shoe shanks or springs, for the making of boots and shoes. These shanks are cut by dies from sheet steel, into strips of about four and a half inches long and of various widths, which are placed on the instep between the leather. These give strength and elasticity to the shoe.

We know of three or four firms using in the aggregate about 1,500 tons of steel yearly in the manufacture of these shanks. Most of this steel comes from England.

We now refer to another kind of shoe—the horseshoe—and the very needful horseshoe nail. The rage for machinery in the States for all purposes, and the consequent education of the workmen up to the point of disliking the old form of manual labor, have made the introduction of machine-made horseshoes and nails an easy task. There are few blacksmiths now who do not prefer to use the ready-made article, which may be had of all shapes and sizes. Of course there is a saving in this, and the time



SKINNER & WOOD'S PORTABLE ENGINE.

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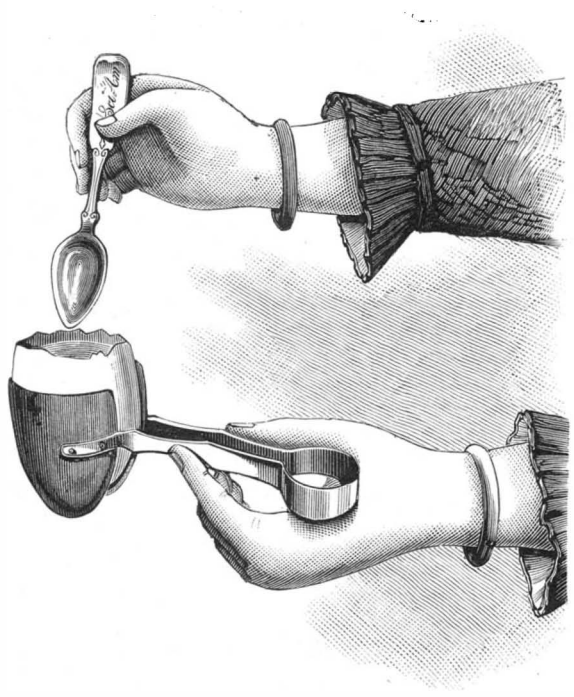
will come when none other but the machine-made goods may be had. The manufacturers, some of whom are named, are said to be now exporting largely, and thus in foreign markets they are cultivating the American liking and preference for these goods. This is not to be wondered at, because the quality, the appearance, the fit, are all they ought to be to win and keep customers.—*British Trade Journal.*

NEW EGG TONGS.

The annexed engraving represents a neat and inexpensive egg tongs recently patented by Mr. R. P. H. Koska, of East Saginaw, Mich. It is one of those devices that is likely to come into general use, as it is as simple as anything well



KOSKA'S EGG TONGS.

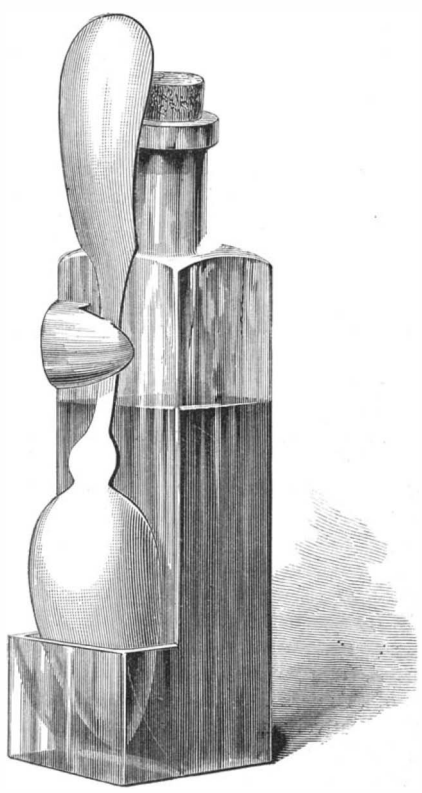
could be for the purpose; it forms a handsome article of table furniture, and will be of great utility, as eggs are now generally eaten soft boiled. This device does away with the egg cup and with inconvenience in handling and breaking the egg, and it affords a simple means of holding the shell while its contents are eaten with an egg spoon, the egg shell forming the cup.

The construction of the device will be readily understood from the engraving. The concave receptacles at the end of the spring handle are of such shape and size as to inclose something more than half of an egg. Each cup carries a small spur, which pierces the shell and assists in holding it.

Further information concerning this invention may be obtained from Mr. R. P. H. Koska, Bancroft House, East Saginaw, Mich.

IMPROVED MEDICINE BOTTLE.

The accompanying engraving shows an improved medicine bottle designed to receive and support the spoon used in taking the medicine.



EARLE'S MEDICINE BOTTLE.

The bottle has upon one side a socket or cup of suitable size and shape to receive the greater portion of the spoon bowl, and near the top of the bottle there is a clip for holding the spoon handle. This device is the invention of Mr. J. H. Earle, of Fall River, Mass.

Engineers.—Their Value.

Under this heading the *Boston Journal of Commerce* comments on the engineer who solves problems—not the man, adds the editor, who opens the throttle valve of a locomotive that goes racing over the track from one city to another, or of him who sets in motion one of the Corliss monsters that drives its thousands of spindles and looms or other machinery—but the civil engineer, who lays out the work that employs the others, deals either in one or the other of two separate and distinct realms—absolute fact or supposition. In the first he is often made to doubt his own sagacity and capability, for he must often change his course of action by reason of deductions drawn from experiment in which all his ideas of strength, elasticity, or economy have strangely departed. If he deals in the second he becomes, as too many have done, egotistical, and by very lack of knowledge or through force of circumstances, is constantly taking up untenable positions, making expensive, unsatisfactory and unsuccessful experiments—in other words, father of failures. Too much of this has been and is done. In many cases the parties are sooner or later involved in an outlay of thousands of dollars, and then comes the legitimate outgrowth of an attempt at the impossible—disagreement, disappointment, law suits, bitter feeling, loss of time, money, production, loss to every one involved; and yet it is a matter of every-day occurrence, and one which would have been avoided by the employment of a competent engineer for a day or two at the cost of fifty or a hundred dollars. Men who know nothing of proportion, strength, elasticity, pressure, torsion, volume, or density, get out an idea and patent it, or advise it and get it introduced, and then users get the effect by adoption.

Engineers are not always consistent, we had almost said not honest. They deal sometimes in vagaries or in elements of uncertainty without careful consideration or consultation of authorities who have preceded them, and give opinions or make out tables or results from preconceived ideas of matters to which they never give an hour's consideration in an honest, careful way. In this way they have in a measure detracted from their usefulness and the respect due them. Such a one, however, is always found out sooner or later, and finds his level. A man to do his work in a successful way should be careful in all his statements, and if he does not know a thing for a *sure thing*, say so, and not assume one thing or the other, for it is in engineering as with law—common sense is a pretty sure guide, and will lead you right a thousand times where it leads you wrong once.

In dealing with earth, iron, water, steel, steam, or any of the natural elements or created forces, we must remember that we are only capable, at least, of an approximation; that we must reason and investigate—and if we live to the extreme allotment of life, we are still learners. The profession has in the last decade done much to attract the attention and merit the admiration of men who never think deeply, clearly, or upon forces or matter other than to see results that are the outcome of close reasoning. There is too much of the superficial, too little of the real; to progress we must look closely at all elements, simple or compound; and when we have learned our own insignificance, we have commenced building upon a "bed rock" that does not "heave or settle."

The Delaware Ship Canal.

The surveys of routes for the proposed Chesapeake and Delaware Ship Canal were completed in December last. Six routes have now been estimated for, as shown in the following table:

No.	Name.	Length in miles.	Length of canal proper.	Cost in millions of dollars.	Relative time of transit in hours.	Saving in distance in miles.
1	Choptauk	149·81	37·67	16½	19½	175
1	Choptauk (inland	138 91	30·00	18¼	18	186
2	Wye	128 42	42·99	26⅛	17¾	196½
3	Queenstown	107 29	53·78	37¼	17	217½
4	Centreville	106 38	50·95	41½	16½	219
5	Southeast Creek	115·78	38 35	25	15¾	209¼
6	Sassafras	129·25	16·20	8	15 1/16	195¾

The lengths given are respectively from Baltimore to a common point at sea, twelve miles outside of the Delaware breakwater. The distance from Baltimore by the route now used to the same point is 325 miles, or 33¼ hours, allowing a speed of 10 miles in open water and 8 miles in dredged canals.

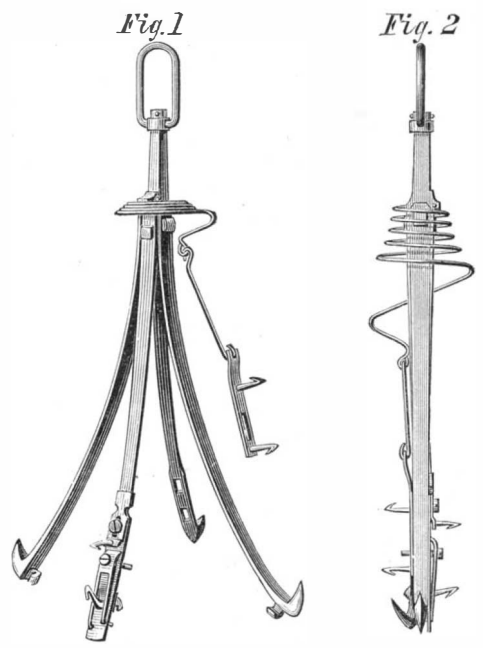
Mr. N. H. Hutton, under whom these surveys were made, reports that the Sassafras route is the shortest in time and the cheapest; but it has very expensive approaches to maintain and very serious conditions to be overcome if it is to be used during the winter. The Centreville and Queenstown routes are the most direct, rate second as to time, but cost largely in excess of other routes; have expensive approaches to maintain on the Chesapeake side, and are, as the Sassafras route, liable to obstruction by ice during the winter. The Choptauk route rates slightly below the Sassafras as to time of transit, and rates third in this respect, while it is second on the list in point of cost, its greatest advantages being in the matters of freedom from obstruction by ice and economy of maintenance of approaches.

More recently Major W. P. Craighill, of the Engineer Corps, has made a new survey of the Sassafras route and estimates its cost at half a million dollars more than Mr. Hutton's estimate. Major Craighill's estimate is for a canal 100 feet wide on the bottom, 26 feet below low water, side slopes one and one-half to one, with a berme on one side 12 feet wide and 30 feet above the bottom.

The other estimates are for a canal 100 feet wide at the bottom, 26 feet below low water. The width is to be 178 feet at low water; the locks to have chambers 600 feet long and 60 feet wide; tide locks only to be built, and these will probably be generally open and only exceptionally used.

IMPROVED ANIMAL TRAP.

The annexed engraving represents a novel animal trap, recently patented by Mr. William J. Taber, of Lookout Station, Wyoming Ter. It is especially intended for catching bears, wolves, and other large animals, and it consists of four curved spring bars provided with hooks, and having a catch and trigger which hold them together when the trap is set, as shown in Fig. 2.



TABER'S ANIMAL TRAP.

Fig. 1 represents the trap after it is sprung. In setting the trap the outer ends of the spring bars are pressed together and held in place by the catch or trigger. The latter is engaged by a bait plate connected with the spiral spring at the top of the trap. The bait is attached to this plate, and when the animal seizes it, the trigger is disengaged and the curved bars spring outward, thrusting the hooks into the sides of the animal's mouth.

The inventor states that the barbs or points cut the mouth of the animal so that it soon bleeds to death.

IMPROVEMENT IN JUGS.

A stone jug is almost the last thing we would expect to see improved, and yet our engraving shows an improvement in this article which possesses the merit of being both simple and efficient. It consists of a passage or vent formed lengthwise in the handle, commencing inside the jug and terminating near the mouth of the jug. In filling the jug air is permitted to escape through this vent, thus allowing the liquid to enter the jug with greater rapidity than it

IMPROVED JUG.

otherwise would, and in pouring the contents from the jug, air enters the vent and fills the space as the liquid escapes.

This invention was recently patented by Mr. Samuel A. Conrad, of Terre Haute, Ind.

THIS has been a bad winter for fur dealers, sleigh makers, ice monopolists, and coal retailers in New York and vicinity.

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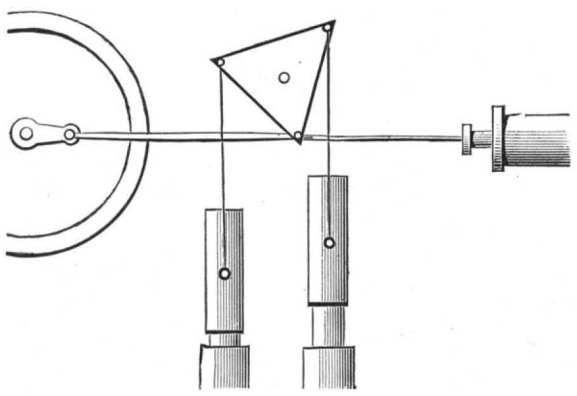
Correspondence.

Novel Pumping Engines.

To the Editor of the Scientific American:

The recently completed new water works of Pittsburg, Pa., include a series of pumping engines of novel design, and whose construction has cost that city $500,000, with an additional $200,000 in litigation. Their general plan and operations are so widely at variance with preconceived ideas as to what constitutes economical and effective pumping machinery, that engineers throughout the country generally denounce the Pittsburg engines as mechanical monstrosities. Their construction was begun several years ago, and as yet, owing to a succession of mishaps, they have not been taken off of the contractors' hands.

The inventor, Mr. Jos. Lowry—Mechanical Engineer to the city of Pittsburg—calls his invention the "graduating plunger" pumping engine. The Lowry engine resembles the Cornish pumper in having a walking beam which operates the pumps. In all other respects this engine differs from the Cornish. Each steam cylinder operates two equally



heavy plungers, and the momentum of a heavy flywheel aids in reaching the results attained. It is a horizontal engine, operating its flywheel on a level with its cylinder, but between cylinder and main shaft of the flywheel, about midway, are placed the novel features in the Lowry engine. These features in chief comprise a triangular, equal-sided walking beam, swinging on trunnions resting upon pillow blocks supported upon the bed plate, and 10 feet above the center line of the cylinder. This beam has a motion in a plane parallel to the vertical plane passing the center line named. This motion is taken directly from a pitman connecting the crosshead with the lower corner of the beam. To the upper two corners of the triangle are attached the pitmans leading downward to the pump plunger, which latter, with the pump barrels, air chambers, valve chamber, etc., are located directly beneath the walking beam and bed plate of the engine. To actuate the flywheel another pitman leads from the lower corner of the beam to the crank of the wheel shaft.

Regarding these features the inventor has this to say: "The great novelty in this engine consists in the manner of connecting the plungers and the steam piston, both piston and plungers being connected to a triangular walking beam and at an equal length of lever from the beam shaft or center, but at such angles that the following result is attained. When steam is admitted, and is at its maximum pressure, the steam piston is operating on the short lever of the beam, and the plunger is suspended on the longest arc of the same; and as the steam grows weaker by expansion the beam leverage increases, permitting a proportionate increase of speed by the piston. Meanwhile the corner of the beam connected with the pump plunger is shortened as to leverage. The result shows that, although the connecting points of both cylinder and plunger pitman are equidistant from the fulcrum, or center of the beam shaft, the steam piston travels 14 feet while the pump plungers travel 11 feet. But the great peculiarity of the engine is the continual varying of the relative speeds of steam piston and plungers. At the beginning of the stroke, when the steam is at its greatest pressure, the lowest plunger is lifted one-fifth faster than the travel of the steam piston actuating such plunger. At the end of the stroke, when the steam is weakened by expansion (cutting off at one-sixth the stroke), the steam piston is given leverage in proportion to this decreased force, permitting the piston to travel three times faster than the plunger. Again, on the descending stroke, the plungers first move slowly, traveling but one-third the rate of the piston, until, at the end of the stroke, it is traveling one-fifth faster."

This plan will be more clearly comprehended by inspecting the subjoined diagram, showing the principle only of the engine. The triangle, etc., are depicted in the position assumed at the beginning of the stroke, and when the crank of the main shaft is on the center nearest the cylinder. The valve chambers occupy the space just beneath the pumps and plungers, and the air chamber is located between the same.

As to labor performed, dimensions, etc., the following are the salient points: The water is taken from the Allegheny River and forced to the height of 356 feet into a reservoir 2,800 feet distant. To accomplish this requires the loading of each plunger to 220,000 pounds dead weight. The engines are four in number, coupled in pairs, each pair operating four such plungers as are described above. One pair is provided with compound cylinders, using the exhaust steam expansively. Their stroke is 14 feet, while that of the plungers is 11 feet 3 inches. Diameter of small cylinder, 64 inches; large, 106⅜ inches. Diameter pump barrels, 40 inches. The engines have been found to give best results when running at a speed of 8 revolutions per minute, though they have been worked all the way from 1 to 9½ revolutions in that time. Diameter flywheel, 32 feet; weight of each, 160,000 pounds. Estimated weight of the 4 engines and pumps, 5,600,000 pounds. In operation these great engines behave handsomely, working without apparent jar or strain. As to their actual duty no thorough test has as yet been made. The inventor states, however, that "in a partial test under many disadvantages, uncovered boilers and steam pipes, etc., the engine raised 4,682,000 gallons of water 356 feet high with the consumption of 300 bushels of coal, equal to a duty of 62,000,000 pounds raised 1 foot per 100 pounds coal used." G. F. M.

Long Distance Telephoning.

To the Editor of the Scientific American:

Noticing an article in your issue of January 17, 1880, entitled "Long Distance Telephoning," I would like to say that nearly six months ago, in connection with the Western Union Managers of Marion, Fort Wayne, Ind., and Defiance, Ohio, I talked with as much ease and clearness as ordinary conversation is now carried on in this city and suburbs by the instruments mentioned in your article, the distance being 166 miles; after which Toledo, Ohio, was put in the circuit, making in all over 200 miles. The lines used were those of the Western Union Telegraph Company's, and as such subject to same conditions as are likely to be met with in nearly any part of the country. The instruments were the Edison carbon transmitter and the Phelps pony crown telephone as receiver, the same as now provided by the Gold and Stock Telegraph Company, of this city, no special adjustment or preparation being made. The future of long distance telephoning is *now waiting* at our doors.

LONG-LINES.

New York, January 16, 1880.

Railroading Reduced to a Science.

We are indebted for the following facts, says the *Railroad Journal*, to an official whose connections with the New York Central and Hudson River Railroad are such as to give him an intimate knowledge of the practical management of that property. From these it will be seen that railroading is fast being reduced to a practical science by Mr. Vanderbilt, as well as by Col. Scott, who was the first railroad president in this country, we believe, to employ scientific experts in the practical management of railroads. The series of experiments by which the results below enumerated were obtained and said facts demonstrated, were commenced under Commodore Vanderbilt, when he laid the two extra tracks, making the first four track road in the world the basis of these experiments.

Under the old two track system the New York Central with its heavy traffic had the maximum switching expenses, which is well understood among railroad men to be the greatest pertaining to the maintenance of a double track road. With four tracks this expense is reduced to the minimum, as well as that for maintaining the track and road bed. This is upon the recognized principle in railroading, that the most economically maintained and operated road is a single track road running only one train from one end of the road to the other and back without switching or switches. Every additional train running in opposite directions requires an additional switch, with additional expense for attendance and maintenance. Hence, the New York Central, with its 20 passenger and 30 freight trains daily, is run much cheaper on what is practically four single track roads, than formerly on its double tracks. There is now no switching or delay by switching and passing of trains from one end of the four tracks to the other, except to local freight trains which gather up and distribute all local freight between the larger stations without hinderance to the through trains which are run with the same engine from Buffalo to Albany or New York as the case may be, without stopping, except for fuel and water. Under the present system, adopted in 1875 or 1876, an engine is kept fired and running until it needs repairs, and not cooled off as formerly while the engineer slept. Now three sets of engineers and firemen are assigned to one engine for each 24 hours, or eight hours each. A locomotive is sent to the shops only once for repairs, it being found cheaper to sell and build new, than repair the second time. In this way the rolling stock of the road is idle (except for want of business) only when under repairs, and is never delayed by waiting for other trains to meet and pass, with the men who run them. It has been demonstrated also, that upon this road even, with its straight tracks, 15 miles per hour for a freight train is the most profitable speed, as above that the increase in wear and tear is greater than the saving in time.

As to the cost of attending and maintaining its tracks, the expense with four as compared with two tracks is as 1 to 8; that is, one man to 8 miles of track now against one man to 1 mile of track formerly. Thus, with more than double the capacity it is able to maintain and attend four tracks for one quarter the former cost of two tracks. This expense was formerly $750,000 per year, or $250,000 more than the present interest on the cost of the two extra tracks. The results upon the traffic of the New York Central for the first nine months after the opening of these extra tracks were that it hauled 75,000 more loaded freight cars and 750,000 tons more of freight than for the same time the preceding year, notwithstanding it included the period of the fierce railroad war of 1876 when there was a scarcity of freight for the trunk lines. It was also then asserted by the officers of the company that the road earned its 8 per cent dividends which were daily ascertained and set aside, to the dividend fund, notwithstanding what were then called "ruinously low rates of freight." From the foregoing it will be seen what a few years of scientific and practical experiment produced in economy of railroad management and also what may yet be done in the same direction.

The Avoidance of Fire Risk in Factories.

The art of constructing houses so as not to burn was described as follows by Mr. Edward Atkinson, in a recent address in Boston:

"The modern factory has no place in it, if we know it, where a rat can build a nest and not be found, or where fire cannot be reached by water. The factory properly consists of a brick wall, with the floor timbers 8 feet apart. These are about 6 inches by 12, and on them is laid 3 inch plank, and sometimes two thicknesses of tarred felt, and then the top floor. The whole construction is open; the spaces between the beams are wide, not narrow; water can be sent in great streams crosswise or lengthwise. The roof is built in the same way, nearly flat, so that whatever happens, there is a standing place upon it for the firemen. There is not a great mass of gables and cornices and concealed spots which modern architecture so many times requires, and which public opinion imposes upon architects, who know better. In the factory we don't allow any furrings or plaster on the walls. There is another thing which we never permit in the factory, but which, like iron shutters, is, I believe, required by the building law of Boston, that the timbers should be connected with the walls, so that when the beam burns off or is torn off, it brings the wall down. We have the beams laid on an iron plate, with their top corners arched off and the bricks immediately above them laid dry, so that if anything happens to those beams they roll out of their places and do not tear the wall down. But the great secret is cleanliness and order and the means of putting out small fires. When the secret is discovered how to make the interest of the assured and the interest of the underwriter identical, and to give the assured an interest in the success of the insurance company, as it is in the mutual company, then discipline may be enforced."

The practical economy of this sort of construction was shown by the following facts:

"Forty-five years ago the Hon. Zachariah Allen, of Rhode Island, having a cotton factory with some of the appliances that are now known to be effective, went to an underwriter of that day and asked that in consideration of those appliances the rate of insurance upon his factory should be reduced. The answer which he received was, 'Oh, we can't send our men around to look into all these little improvements that may amount to something and may not. The rate on cotton factories is 2 per cent, you may take it or leave it.' That induced Mr. Allen to found the system of the mutual insurance of factories, with a system of inspectors who did go around to look into these little appliances and see whether they made any difference in the risk or not. The result of that is a combination of companies, now insuring $200,000,000 a year, each insuring the other. The company of which I am president insured last year $43,000,000; it was a disastrous year in other lines; a year of excessive losses; we have lost less than $14,000. The mutual alliance of companies which Mr. Allen founded 40 years ago returned to their members this year on the 1st of January, on the risks then expiring, an average of 90 per cent of their premiums, and their average premiums on the mills which they insured, instead of being 2 per cent, is nine-tenths of 1 per cent; the sending around of a few young men to see whether these appliances were good for anything or not has reduced the cost of the insurance of those extra-hazardous properties to 9-100 of 1 per cent the past year. Compare that with the other method of insurance which is called stock insurance. Eighty-three New York companies, tabulated by the Superintendent of Insurance of New York, disclose the following facts: That their expenses had been 50 per cent of their premiums, and their losses 70 per cent."

THE ANTIQUITY OF THE SPOON.

The use of our common table utensil, the spoon, is widespread, and its invention, as it appears, dates from remote antiquity. The form which we use at the present day—a small oval bowl provided with a shank and flattened handle—is not that which has been universally adopted. If we examine into the manners and customs of some of the people less civilized than we—the Kabyles for example—we shall find that they use a round wooden spoon. The Romans also used a round spoon, which was made of copper. We might be led, from the latter fact, to infer that the primitive form of this utensil was round, and that the oval shape was a comparatively modern invention. But such is not the case; for M. Chantre, in making some excavations on the borders of Lake Paladru, the waters of which had been partially drawn off, found, in good state of preservation, wooden spoons which in shape were nearly like those in use at the present day; the only difference being in the form of the handle, which was no wider than the shank. The lacustrine station where these were found dates back to the ninth century, and we therefore have evidence that oval spoons were already in use during the Carlovingian epoch. The Neolithic peoples used oval spoons made of baked clay;

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several fragments of such have been found in the Seine, and M. Perrault has also discovered a number in a Neolithic deposit in Burgundy This gentleman found, in addition, a pot ladle. "The table spoons," says he, "are elongated and exactly resemble the wooden spoons in use in our kitchens. Their bowls vary from 3 to 14 mm. in depth." The portions of handles which he collected were too fragmentary to allow it to be determined whether or not they terminated in a flattened handle like the modern forms.

It might be pertinent to inquire to what possible use a spoon could have been put in the Reindeer Age, when raw meat was eaten, and when skin bottles were the only water vessels. Yet a genuine spoon made of reindeer's horn has been discovered in the Grotto of Gourdan. It is oval, very long, and quite shallow. Its handle is very elegant, being covered with engraved figures. Unfortunately it is broken so that it is impossible to say whether the handle was flattened. The slight depth of the spoon should not surprise us, for the men who made it knew neither soups nor sauces, and they could only have used it for the purpose of extracting the marrow from the long bones of large animals, or for eating the brains of the latter, and for such uses depth of bowl was of small consequence. M. Piette has likewise found other well characterized spoons in deposits of the Reindeer Age. One of these, more delicate, narrower, deeper, and less elegant than the one just mentioned, was found in one of the lowermost strata. At a still greater depth in the same deposit he came across a thick rudely made spoon, which appeared never to have had any handle. It was made of rough dressed bone, with polished edges, and its shape was oval. Before the invention of such an implement as a spoon, man of the Reindeer Age employed the spatula; and this is found at all depths in the Gourdan and Lortet deposits. M. Garrigan discovered in the Grotto of Alliat a fragment of reindeer's horn hollowed out in its whole length, and apparently designed for holding liquids; and similar utensils were found by M. Piette at Gourdan. These, however, were probably only temporarily used as spoons, the only genuine spoons which have been discovered being those described above, and which served as models for Neolithic man who afterwards appeared on the scene.

The Hudson River Tunnel.

The *Engineering News* says that in consequence of certain newspaper reports of a sensational style going the rounds, it has obtained the following information regarding the progress thus far made in the construction of the Hudson River Tunnel which is reliable.

A shaft 30 feet in diameter has been sunk in Jersey City, 80 feet west of the Hudson River, to a depth of 55 feet below mean high water.

A horizontal air lock has been placed in position, penetrating the side of the shaft, and the necessary machinery for compressing air has been provided and is now in good working order.

To ascertain as early as possible the effect of the air on the mud, the experiment was tried of driving a heading from the shaft, instead of commencing the tunnel in an open cut. The opening was made 25 feet below high water, the roof consisting of mud 10 feet in depth, underlying loose ash filling 18 feet in depth, the size of the excavation being 15 feet x 6 feet x 4 feet, and the air pressure applied amounting to 12 lb. per square inch. This pressure was kept on four days, during which time no air escaped through the mud. At the end of the second day, the surface of the mud which had been exposed to the air pressure became dry and began to crumble and crack open in places, and at the end of the fourth day these cracks had extended sufficiently through the mud to allow the air to commence to escape. Thereupon, the sides and roof of the opening began to give way, and twelve hours later the whole had fallen in.

The loose filling above was then removed to a depth of 9 feet below high water, the bottom of the trench covered with canvas and timber and the loose filling replaced. A new heading is now being driven in such a manner as not to allow any given surface of the mud to be exposed to air pressure for more than twenty-four hours.

Patent Bills Before Congress.

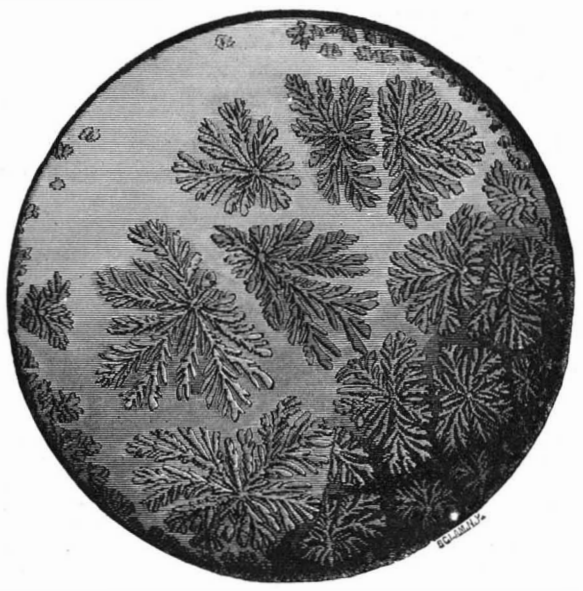
In alluding to the bills before Congress for changing the patent laws, to which we referred a few weeks ago, the *Milling World* in referring to Mr. Converse's bill, concludes that it appears to meet every possible requirement of those opposed to the granting of patents; but is it not a little singular, the editor adds, that such legislation should be attempted in face of the fact that the United States owes its remarkable growth and prosperity to the genius and skill of its inventors, more than to any other source? Take away the incentive (fortune and fame) from our inventors, and we shall soon lose them. It is a mistake to think an inventor can be nothing else than an inventor, and whether protected or not, that he will still invent. He is actuated by the same desires and aspirations as other men; he invents because in that way he thinks he can more quickly realize a competency (how often he fails is, alas! too well known); and the attempt at this time to wrest from him all protection should be frowned down by all who have the real interests of the country at heart. That certain modifications of our patent system can be judiciously made, with advantage alike to the inventor and the public, is no doubt true; but the *Milling World* would suggest the advisability of having such modifications presented by gentlemen of sufficient intellectual caliber to dispassionately consider the interests of both parties.

ON THE CRYSTALLIZATION OF CANADA BALSAM.

BY GEO. M. HOPKINS.

On reading Professor Barker's interesting paper on the crystallization of Canada balsam I was reminded of having observed a similar phenomenon long since. I did not then attribute it to crystallization, nor do I now think the beautiful arborescent forms are anything more than cohesion figures. There is before me at this moment an achromatic objective, the two lenses of which were separated some months ago by first warming them and then introducing between their edges the point of a knife; as the lenses began to separate the arborescent forms appeared, and were so like the forms shown in Fig. 1 (a reprint of Professor Barker's engraving) as to be at once recognized as the same thing. I have again separated the lenses, only partly, however, and there are figures having precisely the same characteristics as those shown in the cut.

FIG. 1.



This experiment may be readily repeated with two pieces of plate glass pressed together with an interposed film of Canada balsam. By separating the plates with a thin edge instrument the adhesion of the two surfaces is overcome, the balsam recedes, and air enters. Now this, I think, is precisely what happened to the objective referred to in Professor Barker's article. It was exposed to the action of the elements for three years, it probably became wet, then frozen. Some of the water entering between the edges of the flint and crown lenses, on freezing separated them, producing the arborescent forms. Upon the thawing of the ice the lenses approached each other, and in so doing inclosed a small quantity of air in the balsam. The next freezing separated the lenses and expanded the air spaces, giving them the beautiful forms shown in the engraving.

Of course it is not known how many times the lenses were separated and allowed to come together in the manner described; it is probable that the balsam after a time dried around the air spaces and thus fixed the arborescent forms.

I cannot leave this interesting subject without referring to a lantern slide, to which I applied this principle, and which forms one of the most beautiful objects that can be projected on a screen. Fig. 2 shows this device. The slide, which is fitted to the lantern, has a circular aperture for the passage of light, and is provided with two springs for holding two pieces of plate glass cemented together with Canada balsam.

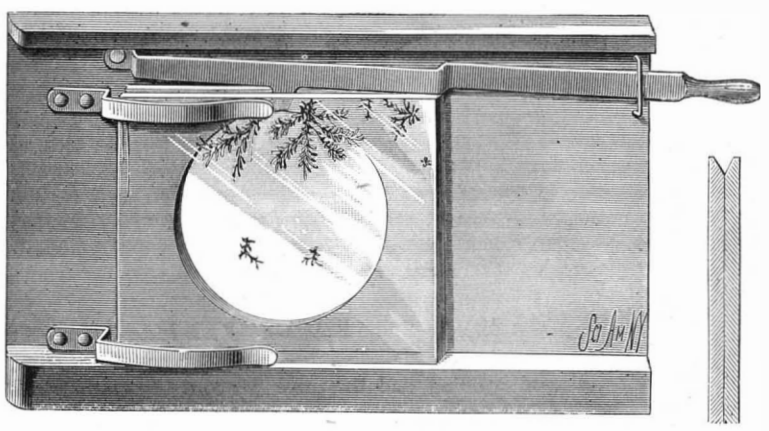


Fig. 2.—LANTERN SLIDE FOR PROJECTING ARBORESCENT FORMS.

The upper and inner corners of the glass are beveled up to within a short distance of the ends, forming a groove or trough for the reception of an aqueous solution of some of the aniline colors. A lever carrying a pointed knife for separating the glasses is pivoted in the upper portion of the slide. At the ends of the glasses the two adjoining edges are beveled—as shown in the small detail view—to receive a portion of the surplus balsam pressed from between the glasses. This extra balsam prevents the entrance of air from the ends of the glasses.

The groove formed between the upper edges of the glasses being freed from balsam is filled by means of a pipette with a strong aqueous solution of one of the more brilliant aniline colors, and the slide is placed in the lantern. Now, by gradually pressing down the lever, the glasses are separated by the entrance of the knife between their edges. The arborescent forms grow downward in the slide, and the aniline color fills them, while upon the screen huge ferns and cacti grow up with great rapidity. Any of the brighter aniline colors will answer and look beautiful; but green seems the most appropriate, as the exquisite forms that appear on the screen resemble leaves and vegetation more than anything else.

Without the application of color the balsam yields images on the screen which closely resemble richly embossed white satin, the form of the figures being substantially like those shown in the engravings. Any viscid liquid will exhibit this phenomenon, but the balsam gives the best results.

What the New York Fair Should Be.

Discussing the favorable prospects for a World's Fair in this city in 1883, the *Tribune* makes a good point in saying that there should be no striving after mere magnitude, but rather an effort to compress the Exhibition into an area of moderate proportions by excluding advertising shows and crude and commonplace articles. The world is weary of colossal displays of objects that may be seen in the shop windows of every town. For a time it was curious to see what each nation produced, without regard to the quality and inherent merit of the articles themselves; but it got all the information it wanted in that direction at Vienna and Philadelphia and twice at Paris, and now it only cares to see the things that are most useful and most beautiful. Let us therefore have an Exhibition in New York that will surpass all its predecessors for real attractiveness and will not appal visitors by its enormous size. Let every square yard of its area contain something to please the eye or instruct the mind, and let the whole Fair be a condensed typical representation of the latest and best achievements of civilization.

The Mississippi River Survey.

The Mississippi River Commission report three triangulation parties, one topographical party, three observation parties, and one boring party in the field at work. These parties comprise a total working force of about 200 men, of whom about 20 are assistant engineers. The triangulation has covered a length of 125 miles between Cairo and Memphis. The topography has reached a little below Tiptonville, nearly ninety miles below Cairo. One of the observation parties is stationed at Fulton, Tenn.; another at Lake Providence, and another at Carrollton. The boring party is below Memphis at work.

NEW INVENTIONS.

Mr. Adelbert O. Müller, of Fremont, Neb., has patented a bushing that will protect the bung hole against charring during the operation of pitching the barrel, and which is also adapted to be tightened up as the stave shrinks, and thus prevent leakage. It consists in making the bushing in two parts, with an internal and external screw thread, to adapt them to be screwed together. The two parts are provided with flanges, which bear against the stave around the bung hole.

Mr. Henry Hartman, of Fort Douglas, Utah Territory, has patented an improvement in carbine holders, which consists of a metal spring clasp having straps attached thereto in such manner as to adapt them for attachment to the saddle.

An improvement in fan attachments has been patented by Mr. Walter M. Vestal, of Marcella Falls, Tenn. The object of this invention is to construct and arrange rods and levers by which motion can be given to a number of fans suspended over a table or elsewhere, for driving away flies and imparting an agreeable motion to the air.

Mr. Lemuel D. Dobbins, of Camden, N. J., has patented an improvement in apparatus for treating celluloid bases for artificial teeth. It consists of a top plate, from which the press and clamp are suspended by means of screw bolts, the plate resting on the upper edge of a cylindrical chamber. It consists in an improved press and clamp, arranged so that the clamp can be readily removed from the press for cooling.

Mr. Bernard T. Murphy, of Marengo, Iowa, has invented a durable and efficient device for hanging gates. It consists, essentially, of an adjustable roller hinge, by which the gate is attached to the gate post, and which admits of the vertical adjustment of the gate and its swinging in one direction laterally.

An improvement in tags has been patented by Mr. Clarence E. Sackett, of Garden Prairie, Ill. The invention consists in securing the wire to a tag in a novel manner, and so that it will not cut it, and so that the tag will lie flat and not turn edgewise when attached to an article.

Mr. James Robertson, of East Cambridge, Mass., has patented an improved system and apparatus for slaughtering animals for food, whereby the work may be done with great facility and economy.

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NEW SYSTEM OF VENTILATION.

All natural methods of ventilation, and all mechanical means relying upon the wind to operate them, must necessarily fail at times, as in a calm, or with but a slight movement of the external air, they lose their motive power and fail to operate, and these failures usually occur at the very time when an active ventilation is most needed.

Those who advocate the use of ordinary fan blowers for ventilation, do not seem to get the full idea of the subject of ventilation and do not realize that a positive and constant circulation must be obtained to secure a perfect ventilation. Such a circulation, it is claimed, cannot be realized except by a system in which an *injection* of fresh air into the room and an *ejection* of the heated foul air from the room may be secured, with the ability of operating both at the same time and by the same power. The use of the blower during the summer (only injecting fresh air into the rooms) may create a tolerable circulation when the weather will admit of opening the windows and doors to allow the heated foul air to escape; but when, as in cold weather, the blower can be used only to send in heated air, and the windows and doors cannot be opened as in summer, there will be an accumulation of heated foul air until the atmosphere becomes oppressive, and then, to get a circulation, the windows are usually thrown open, and a draught of cold air is allowed to enter, to the discomfort and often to the injury of many.

The ventilating system, represented in the accompanying engraving, overcomes all of these difficulties and presents a simple means of thorough ventilation. The motive power is a steam air compressor, which furnishes a comparatively small supply of compressed air to the nozzle, in which the degree of compression is automatically regulated, so that whether larger or smaller quantities of air pass the nozzle, it cannot exceed or fall below certain limits of pressure, which have been determined by careful experiments as most economical in their results. The air ejected from the nozzle, with some *thirty or forty times its bulk of other air*, is carried through proper channels to the rooms to be ventilated.

The nozzle, A, is provided with a valve, B, having an elongated tapering portion, *b*, and a stem, *a*, furnished with a spring, which is set or compressed to a given pressure. The valve is surrounded with a series of short radial ribs having grooves between them, which increase in depth toward the inner end of the valve. It will thus be seen that as the valve is pushed out by an increase of pressure, the volume of the escaping air jet is increased while its pressure remains the same.

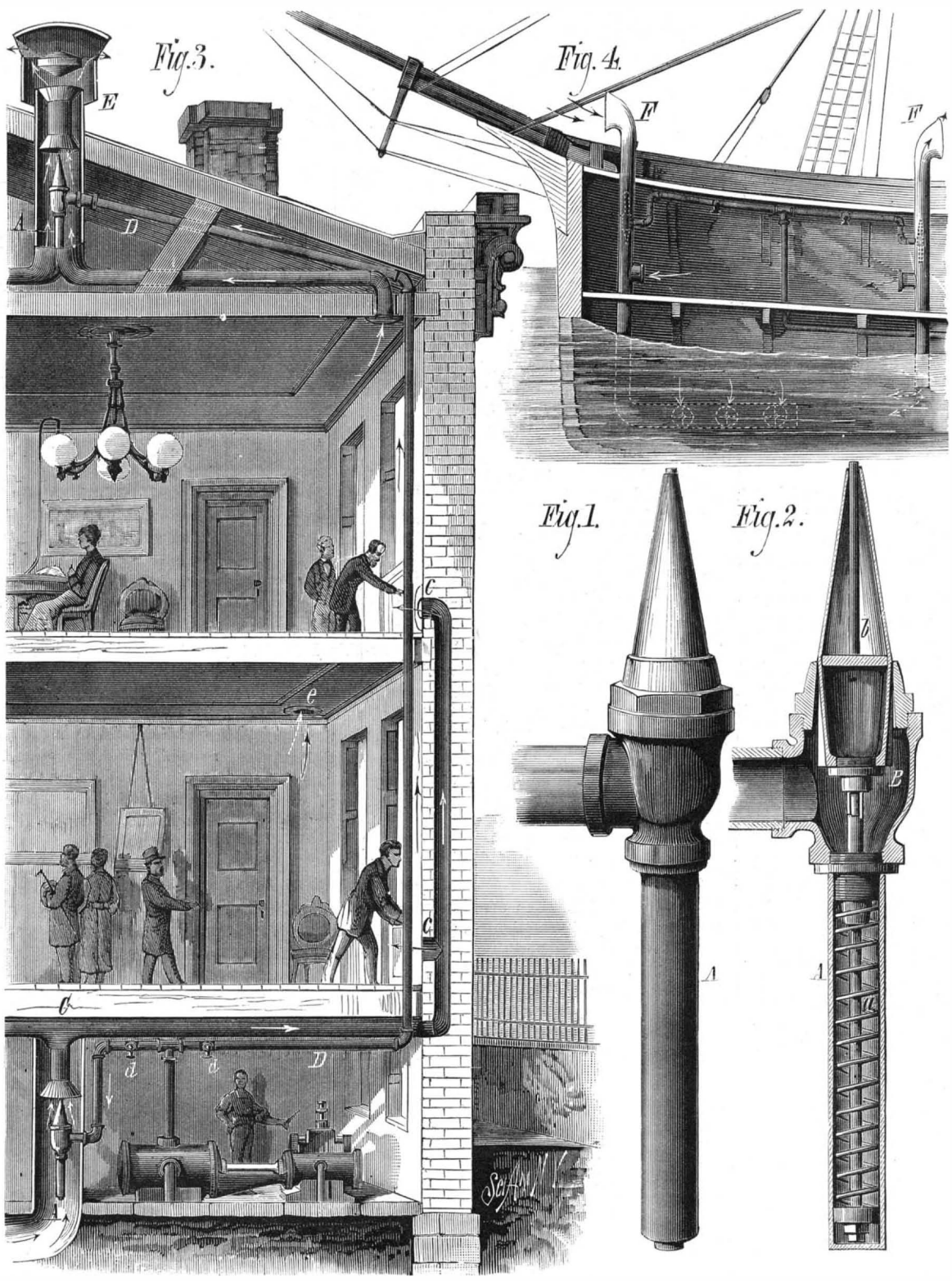
In Fig. 3, C is the fresh air supply pipe which discharges through openings, *c c*, into the apartments of the building. Below a funnel, connected with the pipe, C, an injecting nozzle, A is placed, and connected by a pipe, D, with a pressure air pump in the basement. The pipe, D, also extends to the ejector nozzle, A, in the ventilating shaft, E, at the top of the building, and the ventilating shaft communicates with registers in the ceilings of the different apartments. The air supplied by the direct acting air pressure pump being forced through the lower injecting nozzle, A, induces a flow of air from the air shaft into and through the pipe, C, to the apartments, and the ejecting nozzle, A, in the ventilating shaft, E, creates a strong upward draught, which draws the foul air from the apartments connected with the ventilating shaft. Fig. 3 shows the application of this system to the ventilation of steamships. For this service it is eminently adapted, as the air under pressure may be conveyed in small pipes, and the necessarily small, close apartments may not only be supplied with fresh air, but the foul air may be removed effectually. For steamships carrying cattle and perishable fruits, and to maintain a thorough circulation of air in the hold, it is especially adapted.

For the ventilation of public and private buildings, court houses, school houses, hospitals, public halls, hotels, banks, etc., and for any purpose requiring a complete circulation of air, this system seems very desirable. It has been indorsed by eminent engineers, and approved by many of our government officials.

The great advantages of this method are, that it is rendered entirely unnecessary to construct for ventilation wide air channels for the whole distance from the ventilating power to the place to be ventilated. This is absolutely necessary when fan wheels are used, or other contrivances propelling all the air used for ventilation, resulting in very little pressure and moderate velocity. By employing a very small amount of air, equal to two or three per cent of all of the air to be propelled, and giving it a high pressure and velocity, it may be conveyed in tubes of less than one tenth the diameter, thus reducing the size of the pipe from twenty inches to two inches.

This tubing may lead to the place to be ventilated, and there blow the air through the proper nozzle into the funnel-shaped opening, and the three per cent of compressed air will carry ninety-seven per cent of ordinary fresh air into a building as effectively as a fan wheel would carry it through a pipe ten times the diameter.

Further information regarding this system of ventilating may be obtained from the D. C. Green Ventilating Company, 88 Liberty street, New York city.



GREEN'S SYSTEM OF VENTILATION.

MISCELLANEOUS INVENTIONS

Mr. Elisha Depue, of Silvara, Pa., has patented an improved tool for upsetting tires, carriage braces, and stays, iron rods, and other forgings. It is simple in construction, inexpensive, convenient, and effective.

Mr. Richard A. Kipling, of Roselle, N. J., has patented an electric lamp with carbons crossed so that they can be fed, by simple contrivances, directly against each other, point to point, in such a manner that the luminous arc will be formed around the carbon points where they meet, and shall cast no shadow below them.

An improvement in medicated belts has been patented by Messrs. William W. Vaughan and Joel J. Thom, of Brownsville, Mo. The object of this invention is to furnish a remedy and preventive of fever and ague. It consists in saturating hemp, jute, cotton, or other material, in rope form or otherwise, with tar, and inclosing it in a casing of cotton, linen, or the like, in the form of a belt, band, or strap, so that it may be conveniently secured around the body.

An improvement in combined washing and wringing machines, patented by Mr. Thomas J. Baldwin, of Pacific, Mo., consists of a box for receiving the clothes provided with a lid, which is secured by means of an eccentric bar and lever and rings, this box being supported between two standards and rotated by a crank, the shaft of which passes through one of the rollers of a clothes wringer, mounted on the frame of the machine, and provided with a lever for regulating the pressure. The box contains a number of wooden balls, which are thrown about during the revolutions of the box, and pound and wash the clothes.

An improved medicine spoon, invented by Mr. Barclay T. Trueblood, of Hadley, Ind., consists in a bowl provided with flanges, in combination with a cover fitting over the bowl and sliding under its flanges. With this spoon medicines can be easily and without waste administered to infants and others who resist their administration, and also to those who cannot be raised to an upright position.

An improvement in pressing irons, patented by Elvira A. Russell, of Minneapolis, Minn., is adapted to be placed over a lamp burner like a chimney, and, while serving the same purpose, be heated by the flame of the lamp. It consists in making the iron of the general form of a conical lamp chimney, having one of its exterior sides flattened to form an ironing surface, an extension at the smaller end on the flattened side to serve as a point for the iron, and at the large end a round portion to fit over the burner and hold the iron on the lamp top.

Mr. William H. Huston, of Chauncey, Ill., has patented a guard for doors or windows, formed of a number of sections composed of vertical and horizontal iron or steel bars, these sections hanging on L-shaped hooks in the casing of the door, in such a manner that no section can be removed unless the uppermost section is first removed.

Mr. George W. Ellis, of Philadelphia, Pa., has patented an improvement in the class of trusses for reducing hernia, in which the pad is attached to a slotted bar whose head is held in a clamp that allows adjustment of the pad in various positions.

Mr. William Wilmington, of Toledo, Ohio, has patented an improvement in chill moulds for casting car wheels, the object of which is to facilitate the moulding of car wheels and provide a suitable arrangement for the gas to escape, at the least cost, and without materially impairing the strength and durability of that class of car wheel chills that have in their construction an annular groove in the face of the flange portion of the chill to receive sand, or its equivalent, preparatory to casting the wheel. The reason for filling the groove with sand is to prolong the cooling of the outer portion of the flange of the wheel cast therein, thereby preventing the fracturing of the flange of the wheel which is incident to its rapid cooling and contraction.

Mr. Casper Marti, of New Albin, Iowa, has invented an improved trap for catching rats and other animals, which is simple in construction and convenient and effective. It is capable of catching the animal without leaving any trace or scent to frighten others that may come after him.

Mr. William Osmond, of New York city, has patented an improved device for attachment to the tops of fences, especially in back yards, to prevent cats from crossing or walking upon them, and thus prevent annoyance from the collection of cats by night in the yards.

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ONE OF NATURE'S GLUTTONS.

BY DANIEL C. BEARD.

It was one sultry day last summer that I sent a messenger boy down on Fulton street to secure me a model for a picture I was to paint. After a short time the boy returned, bringing with him a most peculiar individual.

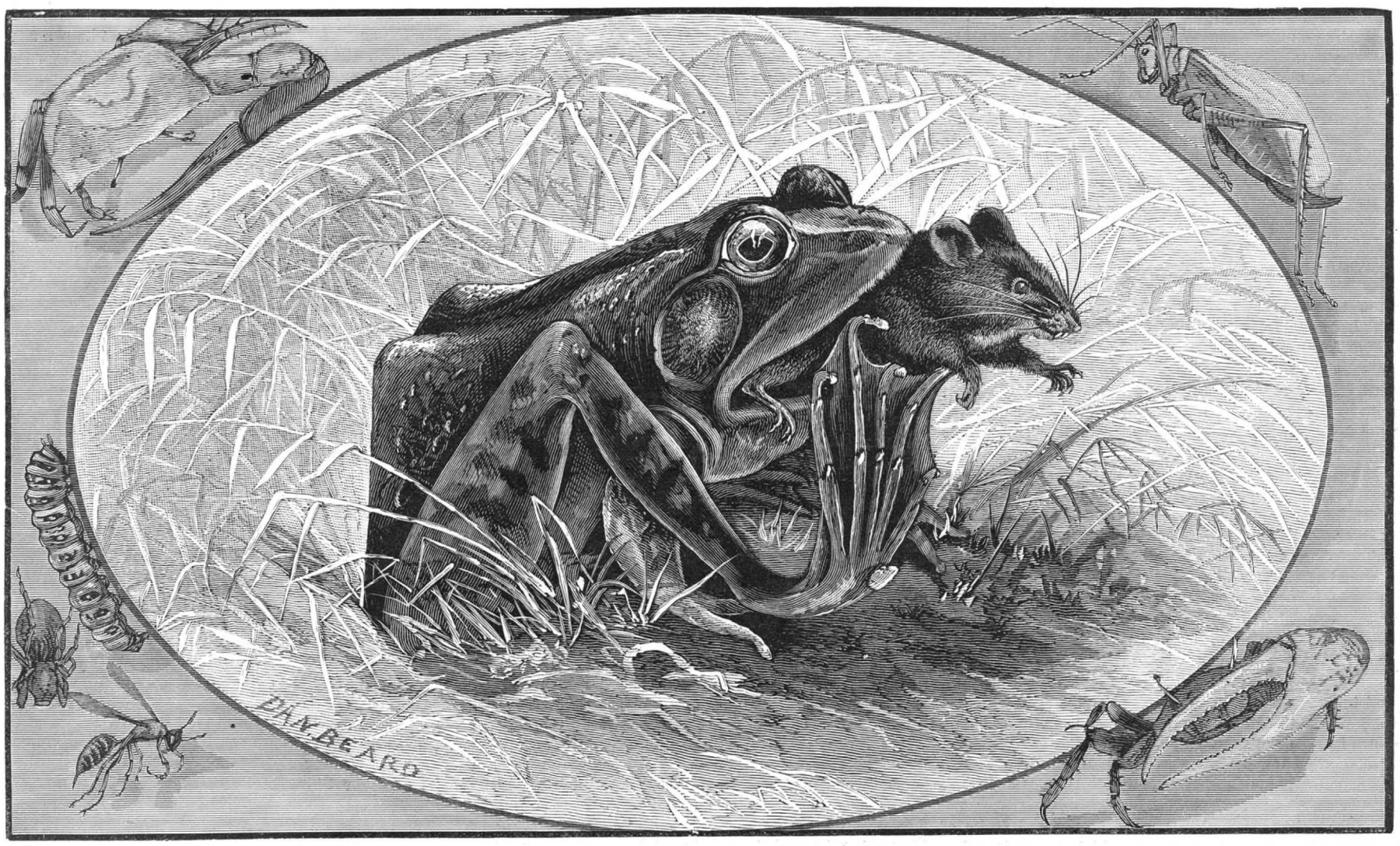
A pair of bright gem-like eyes and a blunt nose, together with a broad, tightly-closed mouth, made up a countenance not easily to be forgotten; and his odd shaped head rested closely upon the shoulders. Add to this a pair of short arms terminating in hands of but four fingers each and disproportionately long legs, to which were attached very broad feet, and you have before you a picture of my model.

A musician by birth and occupation, he belongs to the genus *Rana*, known to naturalists as the *Rana pipens*, but to the schoolboy as the bullfrog! The particular batrachian whose portrait adorns this sheet is quite a favorite, in spite of his previous bad character. Although a tyrant and cannibal, he now numbers among his personal friends many well known artists and noted engravers, who gladly drop their brush, pencil, or graver for the pleasure of seeing the frog devour some crab, bug, or insect that has been captured for him. An old fish globe has been brought into requisition, and through its transparent wall the green prisoner now stares at me as I write. The frog had fasted in this crystal prison for over three weeks before it occurred to me that he might be hungry. To make amends for my neglect I spent almost half a day chasing blue-bottle flies around the room with but indifferent success. However, I captured twenty-five of them, and one vicious hornet that had strayed in through the open window. All these were successively swallowed by the frog in a most business-like manner. A pink fleshy tongue would shoot out and in an instant the insect aimed at would disappear. When he came to the hornet the frog appeared to think his food was rather highly seasoned, for he winked his eyes several times, if that term can be applied to the act of sinking his eyes down in his head and then popping them up again.

Next day he ate fifteen large flies, two big lively katydids, and two full grown fiddler crabs, life-sized drawings of which may be seen upon the border to the accompanying illustration. He had for dessert the same day a dragon fly and an ichneumon fly. I have since tried him with raw meat, but he could not be pursuaded to touch it until a piece cut to represent some insect with long legs was put upon a straw and dangled in front of his nose; this he instantly snapped up.

Insects, crustaceans, mollusks, and small animals, anything with life and not too large to be taken into the capacious mouth of this animal, are greedily devoured, even its own tadpoles and young frogs form a palatable viand for the parent. Once I took a dead mouse and, holding it in the globe, jumped it around to give it the appearance of life. Without hesitation it was seized and speedily swallowed by the frog before he discovered that he had been swindled by a corpse. He then opened his mouth and with his fore feet deliberately pulled out the obnoxious mouse in a manner that set the spectators off in roars of laughter. Since then he has devoured many live mice with apparent relish, all of which he swallowed tail foremost, keeping up a lively kicking and scratching with fore and hind feet to prevent his prey from curling up and biting. Enough water is always kept in the globe to keep its inmate moist, but too shallow for a mouse to drown in. The wily batrachian is well aware of this fact, for it is not until nothing but the head and fore feet of the mouse protrude from between his jaws that he bends his head down, holding it and the mouse under water until the latter is suffocated before it is finally gulped down. Partly to make a more even fight and partly as an experiment to see what the frog would do under the circumstances, a little over a month ago, before putting in a large male mouse, we emptied all the water from the globe. Then ensued a chase; round and round went the mouse, trying in vain to scale the glassy walls, but never missing an opportunity to give the frog a savage nip with its sharp teeth. Round and round plunged the batrachian after him. Once he caught the mouse by the tail, whereupon the mouse turned and mounted the slimy back of his enemy and bit him severely; but quicker than thought the powerful hind leg of the frog swept the mouse from his back and dashed it violently against the side of the globe.

The battle had commenced and lasted about five minutes, when by a lucky snap the frog got the mouse by the hind quarters; the little mammal buried his sharp teeth in the frog's nose. Then again did the mill-pond croaker exhibit an intelligence and activity which I had always been led to believe these creatures never possessed. He kicked with his hind legs and pawed with his fore legs with such vigor that the rodent had very few opportunities of biting. Once the mouse's teeth fastened upon the hind foot of the frog, causing him to turn two or three complete somersaults in his efforts to free himself. The mouse was so large that it was no easy task for the *Rana pipens* to swallow him. Slowly but surely, however, he disappeared, until nothing but the head was visible. There being no water in the globe the frog could not drown him, so he did the next best thing—choked him to death by squeezing his neck until the poor rodent's bead-like eyes stuck out from its head, and life was extinct.



BULLFROG DISGORGING A MOUSE.

Scientific Gymnastics.

Exercise, to be beneficial in the highest sense, should be for itself alone; it must not be work in any sense; it should pursue its own objects, and no other; it should be made a pleasure and not a labor; it should be utterly divorced from ulterior notions of economizing expended powers; and this should never more firmly be insisted on than in the case of those abnormal creatures who say they take no pleasure except in useful work.

The theory of scientific gymnastics is directed to bring about three qualities in the tissues. 1. Responsiveness; 2. Endurance; 3. Strength. The first of these is displayed in suppleness or agility. The muscle is well under the control of the will; it responds at once, with promptness and to the required extent. The quick blow of the prize fighter, the exactly graded and lightning-like motion of the swordsman, are examples. Not only is the nervous message transmitted from the central organ to the muscle with the utmost rapidity, but the contraction of the muscle is just so much and no more than the designed effect demands for its accomplishment. This is what we mean by *responsiveness.*

Endurance is the capacity of repetition of the same act, the reiterated discharge of the same amount of nerve force to produce equal muscular contractions for an indefinite period. It is the "staying power" which the tissues must acquire in order to do their best work. It also means the learning and adoption of the line of least muscular force to perform a given task. This is slowly acquired, but when once known, allows of the performance of apparently most onerous tasks with little effort.

Strength is the third, and, beyond a certain moderate amount, least important end of athletic training, although it is often put first. The utmost strength that it is possible for any one to acquire is strictly limited by conditions of age, height, weight, and structure beyond the individual's control; nor is it at all necessary to develop the strength of muscles to their utmost in order to reach their utmost physical perfection. Quite the reverse, indeed, is the case.

To develop these three qualities of tissue wholly different methods of physical culture are required. They do not go hand in hand. The country lout with big muscles that can throw an ox has, as a rule, little endurance and less responsiveness. All army surgeons know how soon these big strong fellows will break down. The circus clown, agile as a cat, is often physically weak, and with no more endurance than an ordinary mortal.

Moreover, all three of these qualities are to be imparted to all the muscles of the body, in proportion to their uses, so that a symmetrical development may be secured. The blacksmith, with his mighty right arm, but who is "blown" in a foot race of a hundred yards, and the ballet dancer, with her legs like Diana's and her arms like stems, are familiar examples of the absence of symmetry.—*Medical and Surgical Reporter.*

The Benzoate of Sodiun in Consumption and Diphtheria.

The inhalation of the benzoate of sodium in phthisis continues to attract attention in Germany. Prof. Rokitansky, of Innsprück, was the first to advocate it, and Dr. Winternitz and others who had visited his clinic report upon it very favorably. They aver that nearly all cases improve upon it, at least at first. This result is categorically denied by many other observers.

Its success as an agent in diphtheria is attested by Dr. Letzerich, of Berlin. The pseudo-membrane is dusted with powdered benzoate, applied through a glass tube or quill, two or three times a day. Older children may use a gargle of one part to twenty. The temperature and pulse together decline under this treatment. The pseudo-membrane contracts and becomes thinner and more transparent.

IT is estimated, by those in position to know, that more miles of railroad will be built during 1880 in this country than during any year before. About 9,000 miles of new road are already under contract.

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THE ACTION OF LIGHT ON PLANTS.

The phenomena which the prolonged action of sunlight produces on vegetation in high latitudes are recorded by M. J. A. Broch in a work recently published.

The farther we go eastward from the Gulf Stream the more severe is the climate, even though the degree of latitude be the same. Thus Scandinavia and Finland possess an exceptionally mild climate, considering their high polar altitude. Indeed, barley and oats will ripen in the most northern districts of Norway, Sweden, and Finland, and immense forests are met with; while in Iceland, Greenland, and the polar confines of Russia and America, the earth is barren and sterile, and there are eternal snows. The cause of these advantageous climatic conditions is to be attributed to the enormous mass of warm water and hot air which the Gulf Stream brings down from the equatorial region to the coast of Norway, and which it approaches between 60° and 61° of latitude. This circumstance, together with the difference in the geological formation of the various northern countries of Europe, naturally lead to certain dissimilarities in the respective climates of these countries. The isothermal line passing through the places whose mean temperature is zero—skirting in Norway the chain of mountains and the sea coast from the North Cape, embracing also the central part of that country between the 60th and 63d parallels—begins in Finland at the 66th degree of latitude and rises rapidly to the north, forming a curve which incloses the elevated lands of the interior between the Gulf of Bothnia and the Arctic Sea, so that not only the countries situated south of that parallel, but also those which slope toward the Arctic Ocean and are submitted to the salutary influence of the Gulf Stream, have a mean temperature above zero. Of all the countries situated in the same latitude as Finland, the Scandinavian peninsula alone enjoys a milder climate. European Russia is much colder, and the climate of Asiatic Russia still severer. With regard to the action of prolonged solar light on the vegetation common to all those countries, Dr. Schübler, of the University of Christiana, has demonstrated that the seed of corn or other plants obtained from the northern regions ripens more quickly than that produced in the more southern countries. In the regions of the extreme north, where grain crops are uncertain in their yield, the seed corn of the north is always used in preference to any other. It is not less true that the various kinds of grain and vegetables cultivated in the northern regions yield better and are much richer in carbo-hydrates than the varieties cultivated more to the south. The color, moreover, is deeper—a phenomenon which applies also to all trees and plants. Foreign botanists visiting Norway and the other countries of the extreme north, in summer, are astonished at the fresh dark green of the foliage, and the bright colors of those flowers which grow both in northern and southern climes; and as this richness of color increases regularly with the latitude, trees and plants have at first been considered as new varieties. The leaves of trees grown in the north are larger even when the seed has been brought from more southern countries. M. Schübler has likewise proved that the aroma of all kinds of plants and fruits, both wild and cultivated, increases as the north is approached. Ordinary vegetables and herbs grown in high latitudes have a far more aromatic taste than those grown in southern countries. The caraway is an example of this fact; grown at Christiana, it contains 5·8 per cent of volatile oil, while that cultivated in Germany and Central Russia contains only from 4 to 4·8 per cent. But this large development of aromatic essence is not always considered an advantage; for instance, the tobacco plant grown in Norway or other northern countries contains, it is said, too much nicotine. In proportion, however, as the aroma increases with the latitude the saccharine substance diminishes; the berries and fruits of the north are less sweet than those which are cultivated or grown wild in the more southern parts of those countries. Consequently, while Norway, as well as Sweden, and even Finland, produces the most delicious apples, the pears are not sufficiently sweet. These facts, as well as the rapid growth of vegetation in the northern regions, are attributed to the prolonged action of solar light. Indeed, at Christiana, at the summer solstice, the sun remains below the horizon only 5 hours 17 minutes; at Trondhjem, 3 hours 34 minutes. At Bodöe, the chief town in Nordland, the sun does not descend below the horizon from June 2 to July 11; at Tromsöe, from May 20 to July 24; at Hammerfest, the chief town of Finmark, from May 15 to July 29. On the other hand, the center of the sun does not appear above the horizon at Bodöe from December 14 to December 28; at Tromsöe, from November 25 till January 16; and at Hammerfest, from November 20 to January 21. It is not surprising that barley, potatoes, and many other plants and vegetables ripen in the most northern latitudes, seeing that they are exposed to a considerable amount of heat during two or three months of the year. In those regions where the sun hardly descends below the horizon in summer, there is no night, only a short twilight; and the growing plant, therefore, enjoys permanently and without interruption the heat and light which it requires.

Mactear's Artificial Diamonds.

Some weeks ago an item was cabled from London to our daily newspapers stating that real sparkling diamonds had been artificially made by a Glasgow gentlemen which withstood all the tests used in determining the natural stone. The *Journal of the Society of Arts* brings us the following facts concerning the alleged great discovery.

Professor Nevil Story Maskelyne, F.R.S., of the British Museum, has examined the presumed "diamonds" manufactured by Mr. James Mactear, of St. Rollox, Glasgow. The result of his examination is in a letter to the *Times*, from which the above *Journal* extracts:

"First, the diamond excels all substances in hardness. Secondly, its crystals belong to the cubic system, and should not, therefore, present the property of doubly refracting light. Frequently, however, from the influence of strain within the crystal, caused by inclosed gas bubbles or other causes, diamonds are not entirely without action on a ray of polarized light sent through them. Finally, the diamond is pure carbon, and as such, burns entirely away when heated to a sufficiently high temperature in the air, and more vividly so burns or glows away when heated in oxygen gas.

"The specimens I had to experiment upon were too light to possess appreciable weight, too small even to see unless by very good eyesight or with a lens, yet were, nevertheless, sufficiently large to answer the three questions suggested by the above properties.

"A few grains of the dust, for such the substance must be termed, were placed between a plate of topaz—a cleavage face, with its fine natural polish—and a polished surface of sapphire, and the two surfaces were carefully 'worked' over each other, with a view to the production of lines of abrasion from the particles between them. There was no abrasion. Ultimately the particles became bruised into a powder, but without scratching even the topaz. They were not diamond.

"Secondly, some particles, more crystalline in appearance than the rest, were mounted on a glass microscope slide, and examined in the microscope with polarized light. They acted each and all powerfully in the manner of a birefrangent crystal. It seemed even in one or two of them that, when they lay on their broadest surface (it scarcely be called a 'crystal face'), a principal section of the crystal was just slightly inclined to a flattish side of it in a manner that suggested its not being a crystal of either of the ortho-symmetrical systems. Be that as it may, it was not a dianiond.

"Finally, I took two of these microscopic particles and exposed them to the intense heat of a table blowpipe on a bit of platinum foil. They resisted this attempt to burn them. Then, for comparison, they were placed in contact with two little particles of diamond dust exceeding them in size, and the experiment was repeated. The result was that the diamond particles glowed and disappeared, while the little particles from Glasgow were as obstinate and unacted on as before. I had previously treated the specimen I have alluded to as the first on which I experimented by making a similar attempt in a hard glass tube in a stream of oxygen, and the result was the same. Hence I conclude that the substance supposed to be artificially formed diamond is not diamond and is not carbon; and I feel as confident in the results thus obtained from a few infinitesimal particles that can hardly be measured, and could only be weighed by an assay balance of the most refined delicacy, as if the experiments had been performed on crystals of appreciable size.

"Not content with merely proving what these crystalline particles are not, I made an experiment to determine something about what they are.

"Heated on platinum foil several times with ammonium fluoride they became visibly more minute, and a slight reddish-white incrustation was seen on the foil. At the suggestion of Dr. Flight, assistant in this department, a master in the craft of the chemical analyst, these little particles were left for the night in hydrofluoric acid in a platinum capsule. This morning they have disappeared, having become dissolved in the acid, and on evaporation there is seen a slight white incrustation, on the capsule, of the residuary fluoride. I have, therefore, no hesitation in declaring Mr. Mactear's 'diamonds,' not only not to be diamonds at all, but to consist of some crystallized silicate, possibly one resembling an augite, though it would be very rash to assert anything beyond the fact that they consist of a compound of silica, possibly of more than one such compound."

Mr. Maskelyne concludes that "the problem of the permutation of carbon, from its ordinary opaque black condition into that in which it occurs in nature as the limpid crystal of diamond, is still unsolved. That it will be solved no scientific mind can doubt, though the conditions necessary may prove to be very difficult to fulfill. It is possible that carbon, like metallic arsenic, passes directly into the condition of vapor from that of a solid, and that the condition for its sublimation in the form of crystals, or its cooling into crystal-diamond from the liquid state, is one involving a combination of high temperature and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment."

THE INDUSTRIAL USES OF FISH SKINS.

Although the skin of fishes is chiefly gelatinous, and easily soluble in water, some are of a firm, strong texture and of a useful character. Up to within a few years, however, their employment for practical purposes has been rather limited, and it is only comparatively recently that attention has been more generally directed to their utilization on an extended scale. At a Maritime Exhibition held at the Westminster Aquarium in 1876, a Norway exhibitor showed a variety of tanned fish skins, among which were: tanned whale skins; upper leather made from the white fish; skins of flatfish prepared for gloves; skins of soles tanned and dressed for purses; skins of thornbacks prepared as a substitute for sandpaper; and skins of eels, dressed and dyed, suitable for braces, etc. Shoes have been made at Gloucester, Mass., from the skins of the cusk or torsk (*Brosmus volgaris*), the use of which has been patented, and an industry is said to be carried on at Colborn, Canada, with the skins of species of siluroids for glove making. In Egypt, fish skins from the Red Sea are used for soles of shoes. The skin of the losh or burbot (*Lota maculata*) is used by the people in many parts of Russia and Siberia to trim their dresses. It is also utilized by some of the Tartar tribes, as material for their summer dresses, and the bags in which they pack their animal skins. The inhabitants of the eastern coasts of the middle of Asia clothe themselves with the tanned skin of the salmon. The spring and tuberculous skins of many sharks and allied fishes are largely employed, under various trade names, for polishing woods, and for covering boxes, cases, etc. From a certain portion of the skin of the angel shark (*Squatina angelus*) the Turks make the most beautiful sea-green watch cases. Turners, ebonists, and carpenters in Europe use the rough skin of the blue dogfish (*Squalus glaucus*) like emery paper, for smoothing their work and preparing it for polishing. This shark skin is also made into shagreen. That most used at present appears to be the skin of the ray (*Hypolophus sephen*), which is very common on the Malabar coast. The house of Giraudon, Paris, makes excellent use of them for morocco and *tabletterie*. At the recent Paris Exhibition, this establishment exhibited numerous illustrations of the ornamental application of the prepared skin in large office-table inkstands, candlesticks, boxes and caskets, paper knives, reticules, card cases, photograph frames, bracelets, scent bottles, etc. The fish called *chat* (*Squalus catulus*) at Marseilles is smaller than the angel fish, and furnishes a product known as *peau de rousette*. This skin is reddish, and without spots, and of a uniform grain, flat, and only used to make cases and other articles known as shagreen. *Peau de chien de mer* is another name given to some species of *Squalus*. That found on the French coasts is known under the names of *chien marin, rousette tigrée*, etc. Turners, cabinet makers, and carpenters use the skin for scraping and smoothing their work, and it is also used for like purposes by metal workers. This skin, when worked up with the tubercles with which it is studded, takes the name of "galuchat," and is usually dyed green, to cover cases, sheaths, and boxes. Under the name of *chagrin*, these skins used to be much employed in Turkey, Syria, Tunis, and Tripoli; that made in Tripoli being considered the best. It was colored black, green, white, and red.

The Quinealt River Salmon.

The *Transcript*, of Olympia, Washington Territory, describes a new salmon which promises to make a valuable addition to our list of food fishes.

The Quinealt River is situated midway between the mouth of the Columbia River and Cape Flattery, and empties into the Pacific Ocean, thirty-two miles north of Gray's Harbor. Salmon of one of the finest varieties visit this stream, and commence ascending the river about the 1st of March, and continue running up until the 1st of July. These fish are about 20 inches in length, 6 inches deep, and 3 inches thick, and weigh from 6 to 7 pounds each. They have very small fins and tails, and are very uniform in size and weight. Their color is a deep greenish blue on the back, with silver sides and white bellies. The meat is of a bright red color. They are extremely fat, and when put upon sticks before the fire to cook, as is the custom of the Indians, large quantities of fat drip from them. They are particularly noted for their rich and exceedingly fine flavor, and as far surpass the Columbia River Chinook silver-side as the latter does a dog salmon.

The Indians are very superstitious about them, and as all the catching grounds are on a reservation they have a monopoly of them. When they first commence to run it is impossible for a white man to get one for love or money, as the Indians believe it would stop the run. They are also superstitious about cutting them with a knife, and the first catch is always cut open by the old klootchmen with a sharp shell, and the heart of the salmon thrown into the fire and burned, for fear the salmon will be offended and not come into the river. Later in the season they cut them with knives and are glad to trade them to the whites. In May and June they run in endless numbers, and are as thick as herring in the sound, the water in the river at times being seemingly alive with them. The fish will not take either a fly or hook in any manner, and are only caught by the Indians in their primitive manner with weirs built across the stream, and made of poles and hazel brush. These weirs are built like all other weirs of the country, and are set at certain places in the river. The fish are taken out with dip nets, often from fifteen to twenty at a time. The weirs are made to stop all the fish ascending when fishing is going on, but are opened at other times to allow the fish to go up and spawn (a fact which white fishermen on other streams might heed to their advantage). It is supposed that they spawn in the river and do not ascend to the lake. Those engaged in propagating fish would do well to examine these salmon, as we are satisfied they would be a valuable addition to the varieties of fish now propagated by the United States Fish Commissioners and various State Commissioners. Coming early in the season, they could be put in the same streams with later salmon, and thus continue the fishing season nearly the whole year round. Their eggs can easily be obtained, and the trial, if successful, would be one of the greatest additions to fish culture ever undertaken.

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Olives in California.

Mr. Edward Cooper, of Santa Barbara, California, has 6,000 olive trees, some of them seven years old, and these produce twenty gallons of berries each on an average in a good year, and one gallon of oil is obtained from seven of berries. Trees ten years old in a good soil will average fifty gallons of berries in a good year, but sometimes will yield 150 gallons. After a good crop the trees usually take a year's rest, so that its good years alternate. The oil yield from a mature orchard is estimated by the *Alta California* at 200 gallons of oil to the acre, and of this 50 gallons may be deducted to pay for gathering the berries and making and marketing the oil. Two gallons make a case of Mr. Cooper's bottles; though most of the imported bottles hold two ounces less. According to these figures an acre will yield $900 net annually, but, in the present depressed condition of business, a mature olive orchard would probably not sell for more than $400.

After visiting Europe and studying the olive question, Mr. Cooper believes that the California olive is unsurpassed in fitness for producing a fine table oil. The small purple berry is not so nice in appearance as the large green or whitish olive of Spain, but it is like the olives in those French districts which produce the best oils of Europe. Besides, he considers it excellent for pickling, and much prefers the pickled olives of Santa Barbara to those imported from Spain. A few of these Santa Barbara olives are in market; but are said not to be compared with the Kimball olives of San Diego. Olives like the last, if they could be had in abundance, would soon leave the Spanish article without a friend.

Many persons are preparing to set out olive orchards, and there is a great demand for cuttings, which are the only resource at present; but Mr. Cooper believes that the trees grown from the seed, and budded or grafted, though slower in bearing, will be stronger, healthier, and longer lived. He thinks the roots from the cutting never equal those from the seed in symmetry and vigor of nutrition. The Federal Department of Agriculture is cultivating twenty varieties of the European olive, and will soon be ready to supply applicants with cuttings.

MECHANICAL INVENTIONS.

Mr. James A. Robinson, of Nashville, Tenn., has patented an improvement in cylinder cocks, which consists in combining with a cylinder cock a thimble valve sliding on a stem, a loose pin passing through the stem, and a recessed rod fitted to slide in a cross mortise.

Mr. Harry Oscar Choles, of Upper Clapton, County of Middlesex, England, has patented an improved stock and die for screw threading pipes, etc. This invention has for its object, first, to prepare the pipe for the action of the screw cutting die by removing the burr, and also the hard outer surface of the pipe, this being done in advance of the screw cutting die, but at the same operation with the cutting of the screw thread, instead of at a previous operation, by means of a file, as usual; and, secondly, to feed the die along the pipe as it cuts the screw thread by means of a leading screw separate from the die, but combined with the die stock, instead of relying on the self-feeding action of the die, thereby relieving the die of this part of its work, facilitating the screw cutting operation, and insuring the formation of a perfectly true screw thread.

Mr. William Birch, of Salford, county of Lancaster, Great Britain, has patented an improved machine for guiding and stretching fabrics. The object of this invention is to make an improvement in the governor described in Patent No. 198,787, and to provide means for stretching fabrics in connection therewith. The inventor uses a well balanced frame pivoted in the central line of the passing fabric, and employs in conjunction with them rollers of suitable form.

Manganese Bronze Torpedo Boats.

Mr P. M. Parsons writes to the London *Times* with reference to the manganese bronze torpedo boat recently arrived at Portsmouth from the Thames. Mr. Parsons says that the thickness of the plates forming the skin of this boat was not 3-16 inch, but varied from No. 9 to No. 18 wire gauge, or from little more than ⅛ inch to about 1-16 inch. As regards the quivering spoken of, this only occurs when the engines are working at a certain number of revolutions, which are such as to make the pulsations of the propeller and the vibrations produced by the spring of the vessel isochronous, and this is also experienced in the steel boats when the speed is such that the two vibrations correspond. When this boat was going at the rate of 16 knots per hour, more than which speed she attained one day when Mr. Parsons was on board of her, no quivering or vibration was felt, but it set in when the speed was reduced to about 10 or 12 knots. He admits, however, that the manganese bronze plates supplied for this vessel are not quite so stiff as steel plates of the same thickness; but this occurred simply because in the contract no stipulation was made as to stiffness. The plates were supplied under the condition that they should stand the Admiralty test for steel plates, namely, a tensile strength of from 26 to 31 tons per square inch, with an elongation of not less than 20 per cent before breaking, and to bend cold to a radius twice the thickness of the plate. This test the plates stood perfectly, those taken haphazard and tested by the Admiralty Inspector giving between 29 and 30 tons breaking strain, with an elongation of from 25 to 35 per cent, and bending round cold to half the radius stipulated.

CHINESE PORCELAIN VASE.

The large porcelain vase shown on this page is of Chinese manufacture. The body, neck, and lips of the vase are covered for the most part with a fine vine and flower scroll pattern done in polychrome, but the front portion is occupied by medallions painted with figure subjects. What the subject of the upper design is, is uncertain, though it might very well represent a high official beset by rival office seekers. But the lower picture tells its own story. Here is a grand Mogul seated at his ease, surrounded by his courtiers, watching the performance of a couple of clowns. Standing on the steps, just outside of the Mogul's court, is the master of the clowns, urging the poor fellows on to renewed exertions, while on either hand, keeping him, the master, to his work, are two courtiers, one expostulating with him kindly, and the other standing silent, with drawn sword, and a most sinister look on his face—an action more potent than words.

CHINESE PORCELAIN VASE.

This picture is a very good illustration of Chinese pictorial art. It is full of character and action. It is not fine art, considered by our canons of good drawing and perspective, but it shows more artistic perception and ability to portray the salient points of a situation than many European artists possess.

Accident on Board the Greece.

Spontaneous combustion scores another victory over the ignorance of humanity. On Thursday last the steamer Greece arrived from Great Britain. As the cargoes this way are small or not sufficient to load the vessel entirely, the ocean steamers are bringing over sufficient coal to carry them back, either in whole or in part. In this instance there was a quantity of coal in the lower hold, and it was intended to transfer it from there to the bunkers. The coal must have been damp, and being hermetically sealed in the lowest depths of the ship's hold, there was no chance for ventilation, consequently sufficient carbonic oxide was there generated to cause an explosion upon the application of light. This was done when the men descended to the lower hold to unfasten the hatches. Five deaths have already resulted, and seven persons have suffered severe injuries. The *Coal Trade Review* thinks it is about time that vessel owners and captains became aware of the danger attached to the storage and carriage of this quality of coal (bituminous) in quantity, where it is liable to heating from any cause. Ventilating shafts at least should be made direct from the hold where stored to the outer air.

Phosphorescence in the Caribbean Sea.

Mr. Alexander Agassiz, in his recent "Report on American Dredgings in the Caribbean Sea," states that in the roadstead, under the lee of the islands, there is little pelagic life to be found, and consequently the phosphorescence is far less brilliant than in the Gulf of Mexico. Yet occasionally the masses of *Ctenophora* (a species of *Mnemiopsis*) swimming at different depths, produce a very striking illumination; sudden flashes of light suddenly appearing as if coming from great balls of fire floating a short distance beneath the surface. The most striking phosphorescent phenomena were produced by a small annelid, allied to Syllis, which moved over the surface of the water with great rapidity, performing the most remarkable gyrations and tracing its path, which remained phosphorescent for a short time, by a brilliant line of light. Among the deep water forms several of the species of *Gorgonia* and *Antipathes* (especially *Rüsea*) showed a bright bluish phosphorescence when coming up in the trawl. One ophiurian also, like one of the Mediterranean species mentioned by Panceri, was exceedingly phosphorescent, emitting along the whole length of its arms, at the joints, a brilliant bluish-green light.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR FEBRUARY, 1880.

Mercury.

On February 1 Mercury rises at 6h. 59m. A.M., and sets at 4h. 17m. P.M.

On February 29 Mercury rises at 7h. 11m. A.M., and sets at 6h. 50m. P.M.

In the latter part of February Mercury may be seen after sunset a few degrees north of the point of sunset.

On February 28 Mercury will be seen near Jupiter in the evening twilight.

Venus.

Venus will be brilliant in the morning throughout the month of February, although rising later and coming more nearly into daylight.

On February 1 Venus rises at 4h. 49m. A.M., on February 29 at 5h. 9m. A.M.

On the morning of February 7 Venus will be seen in conjunction with the thin crescent moon; Venus is about 2° north of the moon in declination.

Mars.

Mars will be the most conspicuous of the evening planets. Its great declination gives it a very high altitude at meridian passage; on February 29 its altitude in this latitude is nearly 72°.

On February 1 Mars rises at 11h. 21m. A.M., and comes to meridian at 6h. 40m. P.M., at an altitude of 69°.

On February 29 Mars rises at 10h. 14m. A.M., and sets at 1h. 16m. of the next morning.

Mars will be seen to be among the bright stars of Taurus; on February 9 it will be 2° south of the star Eta Tauri.

The moon will be seen to approach Mars on the evening of February 17.

Jupiter.

On February 1 Jupiter rises at 8h. 47m. A.M. and sets at 7h. 59m. P.M.

On February 29 Jupiter sets at 6h. 42m. P.M.

Jupiter is two nearly in the direction of the sun for good observations.

Saturn.

Saturn as well as Jupiter sets early in February, and it is getting so far off that even large telescopes will not show the smallest satellites.

Saturn sets on February 1 at 10h. 7m. P.M., and on February 29 at 8h. 31m. P.M.

Uranus.

Uranus is in its best position during February.

On February 1 Uranus rises at 7h. 19m., and sets at 8h. 26m. of the next morning.

On February 29 Uranus rises at 5h. 22m. P.M., and sets at 6h. 33m. of the next day.

Uranus is moving away from Lambda Leonis toward Rho Leonis, and on February 29 it has nearly the declination of this star and follows it in right ascension.

A glass of two inches aperture will show the disk of Uranus.

Neptune.

On February 1 Neptune rises at 10h. 57m. A.M., and sets at 12h. 31m. A.M., of the next day.

On February 29 Neptune rises at 9h. 8m. A.M., and sets at 10h. 43m. P.M.

Neptune is among the small stars of Aries.

Occultations.

The "American Nautical Almanac" gives the Washington time, February 16, 11h. 30m. P.M. for the disappearance of Epsilon Arietis, a multiple star, by occultation, or by the moon's passing across it. As the moon will not have reached the first quarter the stars will seem to touch the dark limb and disappear at once; this is always an interesting phenomenon to observe, and is valuable for a determination of longitude. With an ordinary telescope the stars will appear as one.

Sun Spots.

The spots on the sun have been very few for several years. At this time (January 15) two large spots are passing out of sight, in consequence of the motion of the sun on its axis, and a group of some 18 or 20 small ones has made more than half its passage across. These will probably be seen again in February. The large ones should be easily seen somewhat advanced upon the disk on the first day of February.

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RECENT DECISIONS RELATING TO PATENTS, ASSIGNMENTS, ETC.

THE RIGHTS OF ASSIGNEES IN PATENTS.

It frequently happens that an inventor, in order to supply himself with the means to apply for a patent or introduce his invention, agrees with another person that, in consideration of the advance of funds, he will grant an assignment of the invention and of the letters patent therefor, in a certain State or States. The making of such assignments in advance of the issue of the patent is quite common; and when the patent is granted the assignee is the owner of the patent without further transfer, for the district originally conveyed to him.

There have been cases where the inventor has attempted to deprive his assignee of the benefits of the original assignment by dodges like the following: The inventor applies for the patent, and it is officially rejected. His assignee is informed that no patent can be obtained, and the matter is supposed to be closed. But on a subsequent occasion the inventor, having made changes in the invention, files an entirely new application. At last a patent is granted, but the inventor declines to admit the original assignee to any benefits therefrom on the ground that the patent is not for the application on which the advances were based.

The question whether the assignee has any right in such patent has been very forcibly decided in favor of the assignee by the U. S. Supreme Court in the well known coal-burner stove case.

An assignment of April 5, 1853, recites the granting to Littlefield of a patent on the 15th of April, 1851, "for a coal burner so constructed as to produce combustion of the inflammable gases of anthracite coal," and the fact that he had applied for a patent "securing to him a certain improvement in the invention so as aforesaid patented by him," and then assigns to Treadwell and Perry all the right, title, and interest which Littlefield "now has, or can or may hereafter have, in or to the aforesaid inventions, improvement, and patent, or the patent or patents that may be granted for said inventions or any improvements thereon, and in any extension or extensions thereof, within and throughout the district and territory embraced within the States of New York and Connecticut, for and during the term for which the aforesaid letters patent were granted, and the terms for which any patent for the aforesaid improvement, and any other improvement or improvements thereof, or extensions for or of either thereof, may be granted." The Supreme Court of the United States, in Littlefield *versus* Perry (21 Wallace, 205), held that this assignment, "taken by itself, contains, in most unmistakable language, an absolute conveyance by the patentee of his patent and inventions described, and all improvements thereon, within and throughout the States of New York and Connecticut," and that this assignment and a supplemental agreement executed between the same parties at the same time, when construed together, operated to constitute Treadwell and Perry the assignees of Littlefield within the patent laws in respect to the subject matter of the assignment, and to give them and those claiming under them the right to sue in this Court to prevent any infringement upon their rights.

On the 22d of July, 1853, Littlefield withdrew the application before mentioned, which had been filed December 30, 1852, and filed a new application, on which a patent was issued to him January 24, 1854. The Supreme Court held, in the case referred to, that the assignees became in equity the owners of this patent of 1854 under the assignment of April, 1853; that all the patents outstanding and the subject of the controversy in that suit, exclusive of the patent of 1851, were either reissues of the patent of 1854 or improvements upon it; and that the use of the said patents issued after January, 1854, by Littlefield and his co-defendant, Jagger, was an infringement of the rights of said assignees. The patents so referred to were these: A patent issued June 25, 1861: reissues, in two parts, 132 and 133, made November 19, 1861, of the patent of January 24, 1854; reissues, in four parts, 1,332, 1,333, 1,334, and 1,335, made August 26, 1862, of the patent of January 24, 1854, on the surrender of reissues 132 and 133; reissues, in two parts, 1,426 and 1,427, made March 3, 1863, of the patent of January 24, 1854, on the surrender of two of the four reissues of August 26, 1862; reissues, in two parts, 1,478 and 1,479, made May 19, 1863, of the patent of January 24, 1854, on the surrender of the remaining two of the four reissues of August 26, 1862; reissues, in two parts, 1,813 and 1,814, made November 8, 1864, of the patent of January 24, 1854, on the surrender of reissues 1,426 and 1,427; reissue 1,815, made November 8, 1864, of the patent of January 24, 1854, on the surrender of one of the two reissues of May 19, 1863; reissue 1,823, made November 22, 1864, of the patent of January 24, 1854, on the surrender of the remaining one of the two reissues of May 19, 1863; a patent issued December 19, 1862; a patent issued August 18, 1863; and reissue 1,594, made December 22, 1863, of the patent of August 18, 1863. The outstanding patents, when the bill of revivor and supplement was filed by John S. Perry, trustee, etc., against Littlefield and Jagger, on the 6th of February, 1865, were (exclusive of the patent of 1851), the patent of June 25, 1861, the patent of December 9, 1862, reissues 1,813, 1,814, 1,815, and 1,823 of the patent of January 24, 1854, and reissue 1,594 of the patent of August 18, 1863.

A new suit, brought by Perry against Littlefield, to recover ownership and damages in some other patents, additional to those named above, has just been decided in favor of the assignees by Judge Blatchford, in the U. S. Circuit Court in the Northern District of New York.

U. S. Circuit Court—Eastern District of New York.—Benedict, J.

BLACKMAN *et al. versus* HIBBLER *et al.*—GLASS BASE FOR COAL OIL LAMPS.

1. The invention embraced in patent to E. Blackman, February 6, 1872, No. 123,325, is a lamp chimney with the top or upper portion constructed of mica, and a glass base, the two being united and designed to be used together as a unit, and the reissue No. 7,417, December 5, 1876, describing and claiming the base separately, is invalid, as being for a different invention.

2. When the original patent described a certain form of mica chimney united to a glass base, a reissue claiming such glass base in combination with any form of chimney top was regarded as greatly enlarging the scope of the invention by dropping one element from the combination and putting in its place another, not its equivalent

3. A lamp chimney constructed with base and top in one piece being old, no invention was required to conceive the idea that it could be made in two pieces, nor to form a surrounding rim upon the upper part of the base for the purpose of maintaining in position the separate top piece.

Bill dismissed for lack of novelty in the invention.

U.S. Circuit Court.—Eastern District of Pennsylvania.—McKennan, J.

LORILLARD *et al. versus* RIDGEWAY.—THE MARKING OF PLUG TOBACCO BY PRESSURE NOT A PATENTABLE INVENTION.

1. Tobacco having been marked by pressing into its surface metallic or other hard substances, the imprint of which was left upon the tobacco, it was no invention to provide such plates with prongs or projections, and allow them to remain upon the tobacco.

2. Letters and other distinguishing marks having been produced upon tobacco, to put such marks upon a metallic tag, if greater prominence was desired, was readily suggested to the common mind, and did not rise to the dignity of an invention.

Before the Commissioner of Patents.—Paine, Commissioner.

VEGETABLE-LIFE DESTROYER.

The motion is submitted in the following words:

In the application for patent for vegetable sprout killer by Francis B. Rodgers, filed January 2, 1878, the decision of the Examiner denying the patent has been overruled by the Board of Appeals. Applicant requests the allowance of the patent by the Examiner (unless the utility of the patent is denied) in accordance with the decision of the Examiners-in-Chief.

The application relates to a compound or mixture for the destruction of vegetable life.

One of the grounds upon which the Examiner rejected the application was that the mixture was a mere aggregation having no functions differing from those of its several ingredients. The applicant insisted that the compound operated more rapidly and effectually than either of its elements. The Examiners-in-Chief decided, on appeal, that if the mixture described operated more effectually and rapidly, and was more convenient in use, than its elements, the applicant was entitled to a monopoly of his new compound; but in their decision they stated that they were not informed on this point, and suggested that the applicant should be permitted to file affidavits, under Rule 31, in case the examiner should traverse his assertion that the mixture operated as *above stated*. Thereupon the applicant requested the allowance of the patent by the Examiner (unless the utility of the patent was denied), in accordance with the decision of the Examiners in-Chief.

The examiner replied that he did not deny the usefulness or operativeness of the mixture, but denied its patentability.

The applicant appealed to the Commissioner because, as he alleged, the Examiner ignored the decision of the Examiners-in-Chief; and he asked that the Examiner might be instructed to act in accordance with that decision.

The Commissioner held that, inasmuch as the Examiners-in-Chief had decided that if the mixture was operative, as claimed, it was patentable in favor of the applicant, although they had not decided whether it was or was not so operative, their decision was obligatory upon the Primary Examiner, and that it was therefore the duty of the Primary Examiner, if he did not deny that the compound operated as the applicant claimed, to pass the case to issue. Thereupon the applicant requested that the Primary Examiner, inasmuch as he did not deny the operativeness of the invention, should, in obedience to the decision of the Commissioner, pass the case to issue without further delay.

The examiner replied that the Commissioner's decision was that he should pass the case to issue if he did not deny that the mixture operated more effectually and rapidly than any of its elements; and that, while he did not deny the operativeness of the mixture, he did deny that it acted more effectually than its component parts. And he added that, while the suggestion of the Examiners-in-Chief that the applicant should be permitted to submit affidavits would have been consistent with the rules if the Examiner had denied the operativeness or usefulness of the compound, nevertheless, inasmuch as he did not deny its operativeness or usefulness, but only denied that it would act more effectually or rapidly or conveniently than any of its elements, affidavits were expressly prohibited by the last clause of Rule 31, in which it is provided that "affidavits in support of applications will not be received at any stage of the examination unless the office denies that the invention is operative or useful." Upon this action of the Examiner the present motion for the transfer of the case to another division is based.

This motion cannot be granted. The Primary Examiner has not disregarded the decision of the Commissioner, nor has he disobeyed the decision of the Board of Examiners-in-Chief; and, while he has declined to comply with their suggestion that applicant should be permitted to submit affidavits in the case, he has done so in the belief that this course was forbidden by the rules of the office. I am not prepared to say that this impression was incorrect.

But I see no good why the applicant should not be permitted, if he can do so, to show that this mixture acts more rapidly and more effectually than the elements of which it is composed, and is more conveniently used. I think that, under Section 483 of the Revised Statutes, I have authority by an order made with the approval of the Secretary to authorize him to introduce such affidavits.

It is accordingly ordered that the applicant be permitted, within sixty days after the date of this order, to submit affidavits for the purpose of showing that his compound or mixture operates more effectually or rapidly and is more convenient in use than any of the substances of which it is compounded.

The relief demanded by the applicant is denied.

[Approved by the Secretary.]

An undue zeal for the observance of forms and ceremonies is apt to make the ablest officials lose sight of the main object for which they are individually housed in the Patent Office, and for which the patent laws were enacted, to wit: *the promotion of the useful arts by the grant of patents to authors and inventors.* In times past some of the Commissioners and some examiners seemed to labor under the mistaken notion that the chief purpose of their official life was the opposing of inventors, the placing of obstacles in their way, and preventing the grant of patents.

The foregoing case illustrates our meaning: The Examiner in the first place appears to have wrongfully denied the patent. The applicant was then put to the expense of an appeal to the Board of Examiners, who practically decided that a patent should be granted. But the Examiner then holds back the patent on a technicality; the applicant is then put to the further expense of appealing to the Commissioner in person, who supports the little point raised; which now subjects the inventor to further delays and costs in getting up expert testimony. All the trouble to all the parties concerned would have been avoided had the Examiner in the first instance simply issued the patent.

We doubt whether there is any instance where a Patent Office mistake made in favor of the inventor ever hurt the Examiner, the Commissioner, the Secretary of the Interior, or any other official. On the other hand such wrangles as the foregoing are always unprofitable, and do them little credit.

Yankee Inquisitiveness.

The *Price Current*, Portland, Me., suggests a legitimate and wise plan to increase the demand for the products and manufactures of any and every country. When a man has a really valuable article to offer to the world, he should devise the best ways and means to let the buyer and consumer know the source from whence it came, and, if possible, the means and expense by which the recipient may obtain more of the same kind. The result of this justifiable inquisitiveness will be the doubling of the crop of good apples in Maine within a few years. L. J. Stout, of Limington, Me., while barreling apples to be shipped to parts entirely unknown to him, conceived the novel idea of ascertaining their destination by putting a letter, inclosing money to pay the postage on a letter, in one of the barrels, kindly asking the purchaser to write him the date of opening it; his name and residence, the price paid, the condition of the apples when opened, etc. In about three months Mr. Stout received a letter from a merchant in London, England, saying one of his customers found the letter and passed it to him, and by him it was neatly answered, giving all the desired information in regard to the apples, etc. Last winter Mr. Stout received a letter from the same merchant in relation to filling an order for Maine apples, but the quality and scarcity of the fruit last year prevented his filling the order satisfactorily to himself. Last week Mr. Stout received another order by cable for several hundred barrels as samples, from the same person. As Mr. Stout will undoubtedly fill the order, the English gentleman will no doubt be surprised at the size and quality of the fruit—which is this year probably a third larger than two years ago.

The Metric System.

It may not be generally known that we have, in the nickel five cent piece of our coinage, a key to the tables of linear measures and of weights. The diameter of this coin is 2 *centimeters*, and its weight is 5 *grammes*. Five of them placed in a row will, of course, give the length of the *decimeter;* and two of them will weigh a *decagramme*. As the *kiloliter* is a *cubic meter*, the key to the measure of length is also the key to measures of capacity. Any person, therefore, who is fortunate enough to own a five cent nickel may carry in his pocket the entire metric system of weights and measures.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Horizontal Steam Engines and Boilers of best construction. Atlantic Steam Engine Works, Brooklyn, N.Y.

Walrus Leather, Solid Walrus Wheels; Wood Wheels covered with walrus leather for polishing. Greene, Tweed & Co., 18 Park Place, New York.

Campbell's Self-acting Window Shade Rollers are the best in the market. Models and terms to the trade. 85 Centre St., New York.

Wanted—A Drill Press, a Bolt Forging and Heading Machine, and a Pulley Lathe, of some new and improved patent. Good second-hand machines might answer. Address Columbus Iron Works Company, Columbus, Ga.

Engines ½ to 5 H. P. Geo. F. Shedd, Waltham, Mass.

Linen Hose and Rubber Hose of all sizes, with or without coupling. Greene, Tweed & Co., New York.

For Sale—Two Windmill Patents, and set of patterns for same. None better. F. C. Maxwell, Columbus, O.

Wanted—A Machinist of experience, competent to superintend a large manufactory. Address, with references, in full, F. Case, Box 387 Cincinnati, O.

For Sale Low.—Horizontal Engines, 16 x 30, 10 x 36, 8 x 20, 7 x 23; Horizontal Tubular Boilers, two 3½ x 15, one 3 x 13; 35 Horse Locomotive; 3 Horse Upright Engine with 5 Horse Boiler; all in good condition; new (Schenck) 14 inch Planer and Matcher. Belcher & Bagnall, 40 Cortlandt St., New York.

Small High Speed Steam Yachts complete or in parts. Geo. F. Shedd, Waltham, Mass.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Wooden Pumps.—Makers please send circulars to Box 125, Moorestown, Bur Co., N J.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T.Shaw, 915 Ridge Ave. Phila.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

The steam pipes, boilers, etc., in the buildings of the New York *Tribune*, New York *Herald*, and Harper & Bro., are protected with H. W. Johns' Asbestos Boiler Coverings. H. W. Johns Manufacturing Company, No. 87 Maiden Lane, sole manufacturers of genuine Asbestos Liquid Paints, Roofing, etc.

Partner Wanted.—See advertisement on inside page.

Wanted—Two good Machinists; one Plumber, who can do besides common machine work; two good Iron Moulders. Highest wages paid to good men. Address Mountain Foundry, Hazleton, Pa.

Models made to order. H. B. Morris, Ithaca, N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 61.

Wanted.—A Second-hand Turbine Wheel. Give price and dimensions. Address E. L. Pemberton, Fayetteville, N. C.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., etc., sent post free on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Launches and Engines. S. E. Harthan, Worcester, Mass.

Special Wood-Working Machinery of every variety Levi Houston, Montgomery, Pa. See ad page 45.

The Baker Blower ventilates silver mines 2,000 feet deep. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 77.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co Box 423, Pottsville, Pa. See p. 61.

For Machine Knives and Parallel Vises, see advertisement, p 61. Taylor, Stiles & Co., Riegelsville, N. J

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., manuf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free.

The Paragon School Desk and Garretson's Extension Table Slide manufactured by Buffalo Hardware Co.

Silent Injector, Blower, and Exhauster. See adv. p. 77.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 77.

For Pat. Quadruple Screw Power Press, see adv., p. 77.

All makes and sizes of Steam Hammers bored out. L. B. Flanders Machine Works, Philadelphia, Pa.

Millstone Dressing Machine. See adv., page 78.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Forges, for Hand or Power, for all kinds of work. Address Keystone Portable Forge Co., Phila., Pa.

Power Hammers. P. S. Justice, Philadelphia, Pa. p. 77.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 406.

Twin Injectors "Clipper" and "Ajax." "Acme," Governors, etc. Improved; new. Catalogue 1880. J. D. Lynde, Phila., Pa.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 77. Totten & Co., Pitts'g.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. writes: I have a boiler that is good with the exception of about 4 inches at bottom of leg that is eaten badly by salt deposit. I have an idea of raising grate bars and filling with a cement of some kind. Can you inform me how to make it? A. Hydraulic cement, properly mixed, may answer your purpose.

(2) C. F. L. asks how tracing or vellum cloth is made. A. Wagner's tracing cloth is said to be prepared as follows: Boiled bleached linseed oil, 20 lb.; lead shavings, 1 lb.; zinc oxide, 5 lb.; Venetian turpentine, ½ lb.; boil for several hours, then strain, and dissolve in the strained composition 5 lb. white gum copal. Remove from the fire, and when partly cooled add purified oil of turpine sufficient to bring to the proper consistence. Moisten the cloth thoroughly in benzole, and then give it a flowing coat of the varnish.

(3) G. writes: If a 10 lb. weight is dropped from the center masthead of a steamer running 16 knots per hour, what position would the steamer bear to the weight on its reaching the water? A claims that the time occupied by the falling of the weight will cause the steamer to be in advance of the weight's original position at the mast head in the steamer's center, said advance to be computed by the length of steamer and rate of her progress, due allowance being made for force of wind. B claims the weight will fall directly perpendicular, and when touching the water will be in its original position, due allowance being made for the force of wind. A. Neither is exactly right; the weight will strike the deck a very little aft of the perpendicular, as the vessel maintains a constant speed, whereas the weight has the speed of the vessel before dropping, but loses a very small fraction of that speed during the time of falling.

(4) C. M. K. asks: What will destroy or drive away fleas? A. Try pennyroyal or essence of pennyroyal.

(5) D. S. K. asks for directions for silver plating iron and steel. A. Dissolve 12 ounces cyanide of potassium and 1 ounce (troy) of chloride of silver in 1 gallon soft water; filter, and suspend in this bath the chemically clean work and a plate of pure silver, exposing a surface somewhat larger than that of the work. Connect the work with the negative or zinc pole of a small Daniell or Smee battery of two or three cells by means of a stout copper wire, and join the silver plate in a similar manner with the positive pole of the battery. The work may be prepared for the bath by boiling it in a strong aqueous solution of caustic potassa or soda to remove traces of oil, rinsing in running water and scouring with a brush and pumice powder moistened with strong cyanide of potassium solution; then quickly rinsing again, and, without fingering, placing in the bath, and in circuit. A somewhat weaker (in silver) bath, called the "whitening" bath, and a stronger battery, is generally used to whiten or throw on the first film of silver. The proportions for this are: cyanide of potassium, 1 lb.; chloride of silver, ¼ ounce (troy). If the silver runs on dark, use a weaker battery, or break the current so as to give alternate intervals of rest. 30 minutes ordinarily suffices when a battery of 3 or 4 Smee cells, plates 10x4 inches, are used. In the whitening process an additional cell or more is employed. Iron takes silver better after having received a light deposit of copper. The metal must be freed from oxide by pickling in dilute acid and scouring with sand. For coppering a slightly acid bath of the sulphate and a strong battery may be used.

(6) "Reader" asks: Has chromic acid much application in the arts, where manufactured, and what its probable price? A. Yes, several of our large Philadelphia houses now produce the acid. It is quoted at 20 cents per ounce. 2. Can muriatic acid gas be made to combine with turpentine by the aid of heat, or at ordinary temperature without aid of a freezing mixture? A. Turpentine oil forms several compounds with hydrochloric acid. The gaseous acid converts it into the monohydrochloride, $C_{10}H_{16}.HCl$; when the oil is subjected for several weeks to the action of the strong aqueous acid, crystals of the dihydrochloride $C_{10}H_{16}$ 2HCl are obtained. The latter compound is also formed by the action of hydrochloric acid on lemon oil; hence it is called citrene dihydrochloride.

(7) H. H. K. asks how to clean and crystallize the blue vitriol which is found in the bottom of dip jars. A. Dissolve in small quantity of hot water, cool slowly, and evaporate by exposure to the air.

(8) F. W. D. writes: 1. Will you please inform an amateur photographer of the easiest way to recover the silver from waste solutions. 2. If it harms or benefits the silver bath to leave it in the sunlight? A. 1. Precipitate the warm solution by addition to it of common salt; allow it to settle, decant the clear liquid, and throw the precipitate, together with several scraps of zinc, into warm dilute sulphuric acid. When the chloride is all reduced, pick out the remainder of the zinc, decant and press out the liquid from the precipitate, dry, mix it with a little borax, glass, and powdered resin in a small clay crucible, and heat to complete fusion. Cool and break the crucible; the silver will be found as a button in the bottom. With a small crucible, a good fire in an ordinary cooking stove will answer for the fusion. 2. If covered, it is beneficial.

(9) A. R. F. asks: Can I get any more power from an undershot water wheel fitted with appliances to keep the paddles vertical than I can with a common stayed undershot of the same dimensions? If so, how much? A. You can, if the arrangements are suitable to the course of the current. The amount of gain will depend very much upon such arrangements.

(10) C. R. B. asks how to tin iron castings. A. Small articles of cast iron may be tinned by wrapping them loosely with zinc wire and immersing in a solution of perchloride of tin in 10 parts of soft water for 15 minutes. The castings must of course be well cleansed, by pickling them in dilute sulphuric acid and scouring with sand and water or scratch brushing. Use the bath at ordinary temperatures and polish the tinned goods with whiting and the brush. 2. Can you give me any information on soluble glass? A. Consult Feuchtwanger's treatise on Water Glass and its uses.

(11) W. A. C. asks if there is a cheap process by which pine poles can be prepared for service as telegraph poles, something that would preserve them in the ground a reasonable length of time? A. Char the ends slightly and coat them thickly with wood tar.

(12) W. J. R. asks: Please answer the following in your paper. Can I build a cemented wall in water; if so, how? Machinery to pump the water out would be too costly. A. Yes, by using a diving bell.

(13) F. X. M. asks: 1. How can I preserve cider? A. See p. 81, Vol. 41, SCIENTIFIC AMERICAN, "How to Preserve Cider." 2. A stick of wood weighing 100 lb., when converted into charcoal will be very much lighter, say 60 lb. less, and yet will give a much greater amount of heat. What is the chemical process and what change has taken place? What was the 60 lb. (missing from the original) composed of which would seem lost? A. Your assumption that the combustion of 40 lb. charcoal develop more heat than 100 lb. dry wood is erroneous. In comparing equal weights of the combustibles, the available thermal value of charcoal is greater, as wood contains more or less water, incombustible nitrogenous compounds, and volatile combustible matters which escape complete combustion in ordinary furnaces. Consult some elementary work on chemistry and heat.

(14) F. G. asks for a receipt for making black marking ink for boxes, bales, etc. I am familiar with the japan and turpentine preparation, but desire, if possible, an ink that will flow free from the brush and not become gummy. A. Try nigrosine dissolved in boiling water.

(15) P. E. writes: I wish to protect young pear and apple trees against gnawing by rabbits, by the use of lime whitewash; but it washes off the smooth bark so rapidly by rain that it becomes impracticable. Can you tell me any addition to make to the wash that will make it adhere in wet weather? A. Try mixing a small quantity of water glass solution (20 per cent) with your lime. Wash and moisten the wood with alum water before coating.

(16) W. T. S. asks: 1. Is there as much or any more pressure at the top of a steam boiler than at the bottom? I would suppose that the most would be at the bottom on account of the weight of water and steam pressure also. Am I right? A. You are right. 2. Can you explain why an injector throws water into a boiler against the pressure? Because the momentum of the water driven by the steam at a high velocity is superior to the pressure on the valve. 3. Is an inch and one fourth steam pipe large enough to supply a seven and a half by ten engine, running from four to five hundred revolutions per minute? A. No; it should be 2 inches diameter, if the engine runs at usual speed.

(17) M. J. asks: What will remove fruit and wine stains (especially peach and claret) from table linen? A. If uncolored, moisten with dilute sulphuric acid and then rub with a strong aqueous solution of sulphite or hyposulphite of soda; or soak for a short time in a strong aqueous solution of bleaching powder (calcium hypochlorite), press out excess of the liquid, and immerse in dilute sulphuric acid (1 to 10 of water); rinse in cold water, dip in hyposulphite of soda solution, and afterwards wash out thoroughly in hot water. If colored, use plenty of soapsuds and ammonia water. See p. 2511 SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(18) J. E. E. writes: 1. I am intending to build a steam saw mill, 45 horse power. I wish to set the engine 60 feet from the river and 10 feet above the water line. Will I be likely to have any trouble in supplying the engine with water through the pump at that distance? A. Not if your pipes are carefully laid and tight. 2. There is an idea prevalent among engineers here that an engine whose cylinder diameter is 2-3 the stroke is better for saw mills than one whose diameter is ⅓ the stroke, or that a 12x16 is a better proportion than 9x18. Are they correct? A. Ordinarily cylinder ⅓ the stroke is best. The losses from waste spaces and clearances is less.

(19) J. A. W. asks which is properly the front end of an ordinary stationary engine, the crank end or the cylinder end. A. The cylinder end is usually considered the front, whether it be a beam or horizontal engine.

(20) J. H. D. writes: I am building a light draught side wheel boat, 65 feet long, 15 feet beam, making over all 22 feet, to be propelled by 10 foot paddle wheels making 50 revolutions per minute, paddles to be 26 inches long and 10 inches dip. How many paddles would it be advisable to put on each wheel? A. Not less than 10 nor more than 12. The latter will work the smoothest.

(21) E. B. D. asks: What is the cheapest and strongest battery or electric pile you know of? A. The Grenet is cheap and strong, but not constant. You do not state how you intend to use it.

(22) C. B. C. asks whether an induction coil could be made without commutator or condenser, that would give perceptible shocks, using three or four of the large sized cells of battery described in SUPPLEMENT 149. A. A condenser is not required for a coil used for giving shocks, but some kind of an interrupter must be used in the primary circuit.

(23) S. S. D. writes: I am going to try to make an emery wheel for grinding skates, etc. What grade of emery should I get, and what should I mix with it, and how mix? A. You will hardly succeed in making a regular solid emery wheel without expensive moulds and many trials and failures. You may, however, make a serviceable emery wheel in the following way: Turn a wheel of the desired shape from a well seasoned piece of pine board. Heat some emery on an iron plate to 200° Fah., and coat your wheel with good glue of about the consistency used for wood work; roll it in the emery and allow it to dry, then give it another coating of glue and emery. When it becomes thoroughly dry it is ready for use. You should make several wheels of different grades.

(24) C. S. asks (1) how the article in No. 161 of the SCIENTIFIC AMERICAN SUPPLEMENT, about a dynamo-electric machine, is to be understood. I mean that portion describing the electro-magnet. It says there: It is not necessary to use permanent magnets. Electro-magnets may be employed, the slight residual magnetism of the soft iron cores serving to excite the armature. Now how can I make this soft iron core to be magnetic, or must the armature be a magnet? A. Temporarily connect the wires that surround it with a battery; or place it in the magnetic meridian, that is, with one pole toward the north and the other toward the south. It is hardly necessary to resort to either of these expedients, as it is almost impossible to find a piece of cast iron that is not in some degree magnetic. 2. Also please give me the title of some book on such machines; one giving experiments that may be tried with it. A. An elementary work on physics would meet your wants. Ganot's Physics is a good work for you.

(25) S. M. E. asks: 1. What effect will ozonized air have on gelatinous animal substances in course of their manufacture? Will it bleach, purify, and deodorize them? A. It would probably bleach and deodorize them to some extent. 2. Is process practicable? A. We have no record of any experiments in this line. Without a better generator of ozones (ozonifier) than any at present used, probably not. 3. Are fish scales utilized in the preparation of isinglass; if not, by what process can they be practically converted into gelatine in quantities? A. No; it remains to be devised. 4. What books give reliable information as to the various manufactures of gelatin, glue, isinglass, and preparation of hair (from cattle) for mattresses, etc.? A. Consult Dawidowsty's Leim und Gelatin Fabrication.

(26) S. L. H. writes: I was in an assayer's office this morning and saw brought in by a miner something that he thought was very valuable, but it proved to be a mass of iron. Its greatest dimensions over all were: length 13 inches, width 10 inches, thickness 8 inches, weight 130 lb. It seems to be about the quality of best Norway iron, shows regular lamination across the mass, and has the appearance of having been thrown while at a welding heat into a bed of coarse gravel, and is not magnetic. I inclose a fragment chipped from it. It is very tough and would make good horse nails. Is this meteoric iron, or what is it, and are such things common? It was picked up about 8 miles from the Ivanpole gold and silver mines in the northern part of this county. [Judging from the small fragment sent us it is undoubtedly of meteoric

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origin. Meteoric iron is perfectly malleable and may be readily worked in a forge and put to the same use as manufactured iron.]

(27) G. G. G. writes: 1. I am making an induction coil according to directions given in SUPPLEMENT, No. 160, page 2548. How can I tip the screw, which presses against the vibrating spring, with platinum? A. By drilling the end of the screw and driving in a short piece of platinum wire. 2. What is vulcanite? A. Hard rubber. 3. Could not the cylinder of the commutator be made of hard wood? A. Yes. 4. How many sheets of tin foil should be used for the condenser? What size should they be? A. About 50; make them a third larger than the dimensions given. 5. Will common lead foil do, or should they be pure tin? A. Tin foil is best; ordinary tin foil will answer. It need not be made of absolutely pure tin.

(28) W. M. G. writes: 1. In your SUPPLEMENTS the figures of magneto-electric machines, induction coils, etc., are marked "half size.' Do you mean exactly half size, or that the dimensions each way are one half as large as the original? A. The latter. 2. About what would be the weight of the Nos. 16 and 18 wire for the magneto-electric machine described in SUPPLEMENT, No. 161? A. About 2 lb. No. 16 and ½ lb. No. 18. 3. Should the cores for the large magnets be of wrought or cast iron? A. They would be better of wrought iron, but cast iron magnets are easier made and will answer very well.

(29) C. A. B. asks: Does the piston in a rapidly running reciprocating engine stop at the end of each stroke? A. The piston of all reciprocating engines stops at the end of each stroke, otherwise the movement could not be reversed.

(30) F. K. asks how to make a waterproof coating for cloth. A. Dissolve gum caoutchouc in excess of a bisulphide of carbon containing six per cent of absolute alcohol, concentrated by evaporation, away from the fire, as the mixture is quite inflammable.

(31) W. T. D. asks what will remove stains from kalsomined ceilings. In this country we put up a great many ceilings made out of brown muslin. The roof not being waterproof will leak on them and stain them, and rekalsomining them will not cover up the stain. A. Muslin may be bleached by soaking it in solution of bleaching powder, dipping afterward in sulphuric acid diluted with 10 parts of water, and then rinsing in plenty of cold water. 2. What will make muslin waterproof? A. See answer to F. K., above.

(32) G. P. P. asks: 1. How can carbon be soldered to brass or copper so as not to hinder the passage of electricity? A. By the process known as galvanic soldering, or you may copper your carbon by electro deposition and afterward solder the coppered surface to the brass. 2. How can a resonator be made by the use of which a Bell telephone can be heard in any part of a room 12 feet square? A. We know of nothing better than a plain funnel or trumpet similar to an ear trumpet.

(33) W. H. K. asks: Can you inform me what the preparation to polish ladies' leghorn hats consists of, as is used by straw hat manufacturers, and how to prepare and use it? A. An ammoniacal solution of bleached lac, is employed by some makers, we believe.

(34) E. H. N. writes: In a school room near by a new oak floor was laid last August. In the fall a few drops of ink were spilled on the floor, and to remove it oxalic acid in solution was applied, removing the stain where it was, but apparently leaving a kind of "halo" of darkness on the edges of the place where the acid was applied. More acid on this spread the inky matter, until, by successive applications, the color had spread all over the room. A peculiarity of the appearance is the bringing out of black color in places which seemed to have been cleared when water is spilled or sprinkled on the floor By what means can the black be removed? A. Use a little strong hydrochloric (muriatic) acid then plenty of water; afterward dry and oil the floor.

(35) F. R. W. writes: An old photographer tells me that he at one time used bichromate of potash for a positive bath, exposing the paper through the negative for just a moment, and then using a developer which brought out the picture beautifully. He has since forgotten the name of his developer, and cannot do the same thing over. Can you tell me what would develop the picture in such a case? A. Expose the print to the vapor of aniline (oil). The bichromate should be mixed with a trace of phosphoric acid. 2 Also, if there is anything that will stick India rubber to leather, so that neither weather nor usage will separate them? A. Try a cement composed of equal parts of guttapercha and pitch.

[OFFICIAL.]

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FOR WHICH

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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Fabric splitter, M. H. Chapin *et al.*, New York city.
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Firearms, O. Jones, Philadelphia, Pa.
Firearms, W. Trabue, Louisville, Ky.
Gas, O. Lugo *et al.*, Flushing, N. Y.
Grain weigher, W. H. Allen, New York city.
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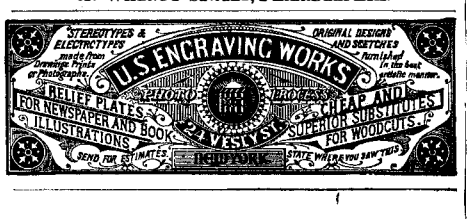
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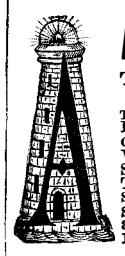

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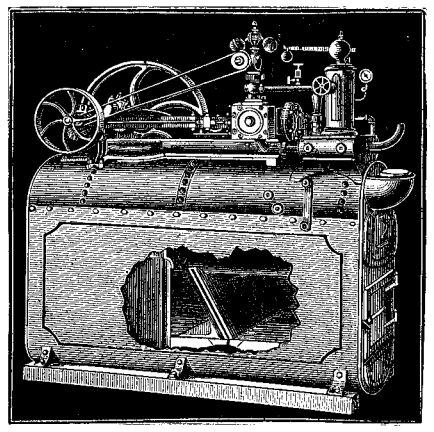

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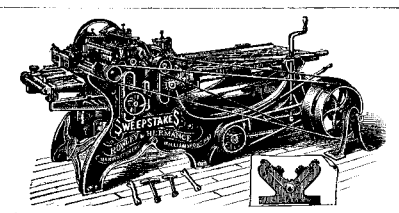

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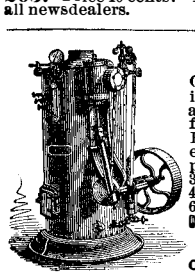

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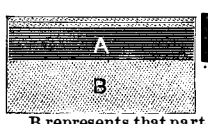

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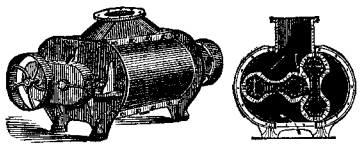
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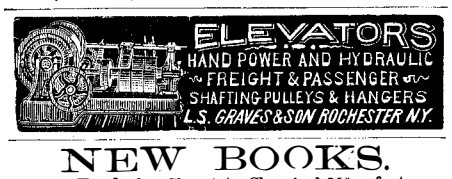

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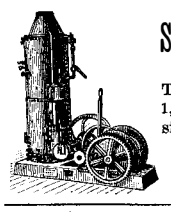

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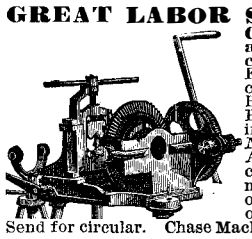
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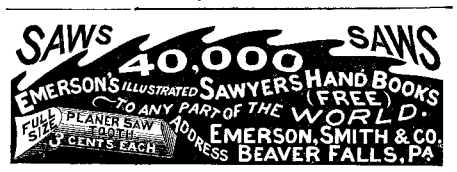

The Sanitary Engineer
Of JANUARY 15 presents a summary of patents obtained and statements printed in the past by various persons tending to show that Edison has been working in a field already cultivated, indicating that any patents he may obtain on the devices reported must be limited in scope and subject to endless litigation.
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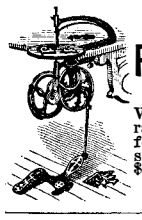
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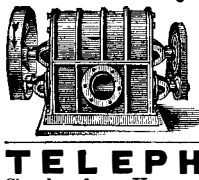
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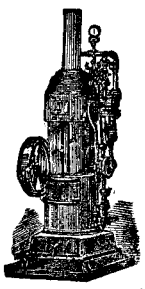

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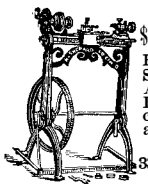

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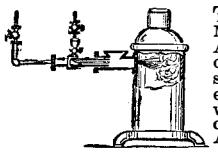

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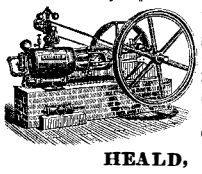

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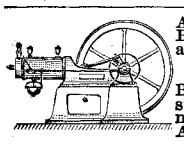

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